

**EPA Superfund**  
**Record of Decision:**

**CAL WEST METALS (USSBA)**  
**EPA ID: NMD097960272**  
**OU 01**  
**LEMITAR, NM**  
**09/29/1992**

**RECORD OF DECISION FOR THE CAL WEST METALS SUPERFUND SITE**

LEMITAR, NEW MEXICO  
SEPTEMBER 1992

RECORD OF DECISION

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CAL WEST METALS SUPERFUND SITE

LEMITAR, NEW MEXICO

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**RECORD OF DECISION  
FOR THE  
CAL WEST METALS SUPERFUND SITE**

LEMITAR, NEW MEXICO  
SEPTEMBER 1992

DECLARATION FOR THE RECORD OF DECISION  
CAL WEST METALS SUPERFUND SITE  
LEMITAR, NEW MEXICO

Statutory Preference for Treatment as a Principal Element is Met and Five-Year Site Review Is Required

**SITE NAME AND LOCATION**

Cal West Metals Superfund Site  
Lemitar, New Mexico

**STATEMENT OF BASIS AND PURPOSE**

This decision document present the selected remedial action for the Cal West Metals site, in Lemitar, New Mexico, which was chosen in accordance with the Comprehensive Environmental Response, Compensation and Liability Act (CERCLA), 42 U.S.C. 9601 et seq., and to the extent practicable, the National Contingency Plan, 40 CFR 300 et seq. This decision is based on the Administrative Record for the site.

The State of New Mexico concurs with the selected remedy.

**ASSESSMENT OF THE SITE**

Actual or threatened releases of hazardous substances from this site, if not addressed by implementing the response action selected in this ROD, may present an imminent and substantial endangerment to public health, welfare, or the environment.

**DESCRIPTION OF THE REMEDY**

The source control remedy addresses the principal threat of lead contamination at the site by treating the soils and source waste materials contaminated with hazardous substances, as defined at CERCLA Section 101(14), 42 U.S.C. 9601(14), and further defined at 40 CFR 302.4, above health based levels. The major components of the selected remedy include:

- Excavation and treatment, by stabilization/solidification to meet the treatment standards defined in this document, of approximately 15,000 cubic yards of contaminated soils, sediments, and source waste materials.
- Disposal of the treated contaminated material in an onsite excavation. Material will not be a characteristic hazardous waste pursuant to the Resource Conservation and Recovery Act (RCRA), 42 U.S.C. 6901 et. seq., after treatment.
- Monitoring the site ground water with existing wells down gradient of the disposal site.

**STATUTORY DETERMINATIONS**

The selected remedy is protective of human health and the environment, complies with Federal and State of New Mexico requirements that are legally applicable or relevant and appropriate to the remedial action, and is cost-effective. This remedy utilizes permanent solutions and alternative treatment technologies to the maximum extent practicable and satisfies the statutory preference for remedies that employ treatment that reduces toxicity, mobility, or volume as a principal element.

Because this treatment remedy will not result in destroying the lead constituents which are the principal hazardous substances of concern, hazardous substances will remain on-site. A review will be conducted five years after commencement of the proposed remedial action to ensure that the remedy continues to provide adequate protection of human health and the environment.

## **DECISION SUMMARY**

### **I. SITE NAME, LOCATION, AND DESCRIPTION**

The Cal West Metals site is located one-half mile northwest of Lemitar and approximately 8 miles north of Socorro in Socorro County, New Mexico (Figure 1). The site is bounded on the east by a frontage road for US Interstate 25. The Interstate is located approximately 250 feet west of the site. The facility is located at an elevation of approximately 4,700 feet above mean sea level (msl) within the northwest quadrant of the southwest quadrant of Section 2, Township 2 South, Range 1 West.

The Cal West Metals site is a former battery breaking and recycling facility. The Cal West property includes approximately 43.8 acres, of which 12.5 acres are fenced. Site operations were located within the fenced area. Layout of the Cal West facility is shown in Figure 2. The site currently consists of two evaporation ponds, three facility buildings, earth berms, soil and battery waste piles, a concrete surface pad, and a salvage area.

### **II. SITE HISTORY AND ENFORCEMENT ACTIVITIES**

A cotton gin facility operated at this site prior to the Cal West battery recycling operation. Cotton gin operations were housed in the northernmost and central on-site buildings. No information is available on specific operations at this facility; however, New Mexico State Highway Department aerial photographs indicate it was active at least between 1961 and 1972.

Cal West Metals was a small scale battery recycling facility and secondary lead smelter operated by Albert and James LaPoint. From 1979 to 1981, the facility processed an estimated 20,000 automobile batteries to recover lead, plastics, and hard rubber components for commercial sale. Lead-acid batteries were crushed on-site and the batteries were separated into plastics, hard rubber, and lead oxides. The plastics, hard rubber, and lead fractions were separated by floatation and centrifugation in a rotating separator drum. Water was recycled through the separator drum and ultimately discharged to the lined pond along with waste sludges. After the discharge line became plugged, sludges were disposed of on the concrete surface pad adjacent to the cotton gin building.

Piles of crushed battery components, in various stages of separation, were stored outdoors from the start of operations to approximately 1989. The broken battery piles are currently stored inside the cotton gin (central) building and stockpiled on the concrete pad adjacent (west) to this building.

The LaPoints conducted research and development on methods of lead recovery from batteries from 1982 to 1984. Site operations decreased substantially after 1984. Since 1985, the company has intermittently reworked on-site battery waste piles to extract remaining recoverable lead

oxides, plastics, and hard rubber and refine the lead recovery process.

The LaPoints borrowed money from the Small Business Administration (SBA) to finance Cal West operations. In 1985, the LaPoints defaulted on the loan and the SBA foreclosed and took ownership of the property. To date, the LaPoints have continued to maintain a presence at the site.

The Cal West site has been the subject of numerous State and Federal investigations and regulatory actions since 1979. Preliminary investigations were conducted by the New Mexico Environmental Improvement Division, now the New Mexico Environment Department (NMED), EPA, and the Lapoints from 1981 through 1989. Based on site investigations conducted by EPA and NMED, the site was proposed for inclusion in the CERCLA National Priorities List (NPL) on June 24, 1988 and officially listed on March 31, 1989. Table 1 summarizes the investigations, findings, and regulatory actions at the Cal West facility.

### **III. COMMUNITY PARTICIPATION**

Public participation activities for this site were met as required in CERCLA Section 113(k)(2)(B)(i-v) and 117. The Remedial Investigation/Feasibility Study (RI/FS) Reports and the Proposed Plan for the Cal West Metals site were released to the public in July 1992. These three documents were made available to the public in the Administrative Record and the information repositories maintained at the EPA Docket Room in Region 6, at the NMED Superfund repository, and at the Socorro Public Library. The notice of the availability of these three documents was published in the Socorro Defensor Chieftain on July 16, 1992. A public comment period was held from July 20, 1992 through August 18, 1992. A request for an extension to the public comment period was not made. As a result, the public comment period closed on August 18, 1992. An open house meeting was held on June 30, 1992 and a public meeting was held on July 30, 1992. These meetings were held to inform the citizen of activities conducted at the Cal West site and to discuss the RI/FS Reports and the Proposed Plan for the site. These meetings were attended by representatives from EPA, NMED, and the Agency for Toxic Substances and Disease Registry (ATSDR). At the request of citizens from Lemitar, a community meeting was held on August 13, 1992 with representatives from EPA and NMED to answer questions related to the remedial alternatives under consideration. A response to the oral and written comments received during this period is included in the Responsiveness Summary, which is part of this Record of Decision (ROD). This decision document presents the selected remedial action for the Cal West Metals site, in Lemitar, New Mexico. The selected remedy was chosen in accordance with CERCLA, and to the extent practicable, the National Contingency Plan. The decision for this site is based on the Administrative Record an index of which is included as an appendix to this Record of Decision (ROD).

**TABLE 1: HISTORY OF SITE INVESTIGATIONS AND REGULATORY ACTIONS**

DATE	SUMMARY OF INVESTIGATION/ACTION
Nov. 1979	NMED issued an Air Quality Control Permit for the operation of a smelting furnace and associated air pollution control equipment.
1979-1985	NMED periodically collected samples from the Bailey well; one sample in 1981 showed lead slightly above the New Mexico ground water standard of 0.05 ppm.
March 1980	NMED issued a Ground Water Discharge Plan for wastewater discharges. The plan required regular monitoring of 2 on-site supply wells.
May 1981	NMED submitted a CERCLA Site Identification form and preliminary Assessment report.
Sept. 1983	NMED conducted an air quality inspection for noncompliance.
Jan. 1984	NMED conducted an air quality inspection.
Aug. 1985	NMED conducted a CERCLA Site Inspection and determined that elevated levels of lead were present at the site. The concentration of lead was above the ground water standard in one on-site supply well.
Aug. 1985	EPA RCRA conducted a Compliance Monitoring Inspection.
Oct. 1985	SBA foreclosed and took ownership of the Cal West facility.
Jan. 1986	EPA RCRA conducted a Compliance Monitoring Inspection and determined that the lead Extraction Procedure (EP) Toxicity limit was exceeded in evaporation pond liquids, south disposal area sediments, waste piles, and drainage area sediments.
April 1986	EPA issued a Tentative Disposition recommending that a Site Inspection Follow-Up be conducted and a Hazard Ranking System package be prepared.
Aug. 1986	EPA RCRA issued an Administrative Complaint to Cal West and a Notice of Noncompliance to the Small Business Administration based on the 1985 and 1986 inspection findings. The Complaint proposed a penalty, cited RCRA violations, and required clean closure of the site.
Oct. 1986	NMED conducted a Site Inspection Follow-Up and determined that high lead levels were present in surface soils and drainage sediments north and south of the fenced area.
July 1987	EPA and Cal West signed a Consent Agreement and Final Order requiring submittal of a closure plan, soil sampling plan, a hydrogeologic investigation plan, and financial assurance documentation.
Aug. 1988	The LaPoints initiated ground water monitoring by installing and sampling a monitoring well at the northwest corner of the fenced area.
March 1989	The LaPoints removed topsoil from much of the fenced area and moved operations and equipment into the south building.

May 1989 EPA RCRA conducted a Compliance Evaluation Inspection and determined that lead was present above the EP Toxicity limit in waste piles, the lined evaporation pond, and drainages.

June 1990 Contractors to the LaPoints installed two monitoring wells on-site.

Aug. 1990 LaPoints' contractors collected unfiltered samples from three on-site monitoring wells; chromium, lead, iron, and manganese were detected slightly above ground water standards in well CWMW-2.

Oct. 1990 EPA Superfund and NMED initiated the in-house Remedial Investigation/Feasibility Study (Phase I) to determine if other contaminants of concern were present (other than metals) and focus the comprehensive Phase II investigation.

Sep. 1991 EPA and NMED began the comprehensive in-house Phase II RI to fully characterize the site (identify contaminants of concern) and determine the extent of contamination.

#### IV. SCOPE AND ROLE OF RESPONSE ACTION

This source control ROD addresses the hazardous substances that make up the contaminated site soils, sediments, and the source waste materials. The selected remedy described in this ROD will prevent contact and ingestion of contaminated site materials. Ground water samples collected from the site monitoring wells installed during the Phase II RI/FS do not indicate that a release of contaminants associated with the Cal West site to the ground water has occurred. Therefore, this ROD will address all concerns at the site and will be the final response action for the site.

#### V. SUMMARY OF SITE CHARACTERISTICS

##### SITE FEATURES

The Cal West Metals site lies within the Mexican Highlands of the Basin and Range Province. The site is located in the north central part of the Socorro Basin. The Socorro Basin is part of the Rio Grande Rift, a major north-south trending structural depression. The Socorro Basin is separated from the La Jencia Basin on the west by the Lemitar Mountains and Socorro Peak. On the east the basin is bounded by Joyita Hills, the Lomas de las Canas, Cerro Colorado and the Little San Pasqual Mountains (Figure 11). The Socorro Basin is an open basin connected to the Albuquerque-Belen Basin on the northern margin and to the San Marcial Basin on the southern margin.

The Cal West site is situated two miles west of the Rio Grande and four miles to the east of the Lemitar Mountains on the toe of an alluvial fan along the east-sloping piedmont associated with the Lemitar Mountains. Relief from the Lemitar Mountains to the Rio Grande is approximately 530 feet. Relief across the Cal West site is approximately 25 feet to the east-northeast. The flat lying floodplain of the Rio Grande is located immediately east of US Interstate 25. The Rio Grande is the only perennial surface water drainage in the Socorro Basin.

##### METEOROLOGY

The climate of the Socorro area is predominantly arid to semiarid. Data from the now-inactive Socorro weather station, previously located at elevation 4,585 feet msl, show that June to August are the warmest months and December and January the coldest months of the year. Mean temperatures during July to August range from 75 to 78 F. Most summer days in the Rio Grande valley reach 90 degrees, but a few reach 100 degrees. Mean temperatures during December and January range from 36 to 37 degrees (Soil Conservation Service, 1988).

The mean annual precipitation in Socorro is 9.35 inches (Anderholm, 1987). Nearly half the annual average precipitation occurs from July to September in scattered thunderstorms. These storms, though generally brief, are sometimes intense and it is common for flash floods to occur. Evapotranspiration is generally greater than precipitation and is greatest during May to October. Characteristically, however, there is a wide range of deviations in rates of precipitation and evapotranspiration (Soil Conservation Service, 1988).

Winds in the valley can be highly variable. Winds are predominantly northerly in winter and southerly in summer. Northerly winds are more common in the morning, and southerly winds are more common in the afternoon. Average annual wind speed is 9 miles per hour. Winds are strongest in the spring, averaging about 12 miles per hour. Winds of 20 to 40 miles per hour commonly occur from March to May. Winds are lightest in the fall and winter, averaging about 8 miles per hour (Soil Conservation Service, 1988).

A tripod-mounted portable meteorological station was established at the Cal West site by the

NMED Air Quality Bureau to collect weather data during Phase II air sampling activities. The station included an anemometer, wind vane and temperature probe. Data recorded consisted of month, day, year, time, wind speed, wind vector, wind direction, and temperature and is included in Appendix III, Air Sampling Report, as part of the Remedial Investigation Report.

During the week of September 23, 1991, when air sampling activities were conducted at the Cal West site, temperature conditions varied from a low of 48 F to a high of 86 F. Wind conditions during the sampling period were light to moderate from a southerly direction at average speeds of 5 to 13 miles per hour.

#### SURFACE WATER HYDROLOGY

The Rio Grande is the major surface water body in the region and is the only perennial stream within fifteen miles of Cal West. It flows north south and is located approximately two miles east of Cal West. Numerous ephemeral arroyos drain the Lemitar Mountains and its associated alluvial fans and contribute directly or indirectly to the Rio Grande.

Two west-east trending ephemeral arroyos are located within one-half mile of the Cal West site. The two arroyos are located to the north and south of the Cal West facility fence, respectively. The arroyos flow into the Lemitar Ditch lateral and the Contra Acequia, both of which are channelized irrigation ditches. These ditches eventually drain into the Rio Grande. No surface water samples were collected during the RI field investigation since flowing water was not present in the nearby arroyos during field sampling activities and no rivers are located in the immediate vicinity of the Cal West site.

#### GEOLOGY

The Cal West site is located within the Socorro Basin portion of the Rio Grande Rift, a major structural depression which extends from central Colorado to northern Mexico. The site is situated on the northwest margin of the Socorro Basin which slopes eastward from the Lemitar Mountains to the Rio Grande floodplain.

The site vicinity is underlain by basin-fill deposits consisting of unconsolidated to semi-consolidated sediments of the Tertiary Santa Fe Group and Quaternary deposits. The Quaternary deposits consist of alluvial fan, piedmont slope, terrace, colluvium, landslide, and fluvial materials. These deposits unconformably overlie the Santa Fe Group and are generally less than 20 feet thick. The Santa Fe Group varies abruptly vertically and laterally from coarse conglomerates and gravels to sand, silt, and clay. Alluvial deposits of the Santa Fe Group are divided into the Miocene Popotosa Formation and the Pliocene Sierra Ladrones Formation. Underlying the Santa Fe Group are Tertiary Socorro volcanics, Mesozoic and Paleozoic rocks, and Precambrian igneous and metamorphic rocks, respectively.

Site-specific geology was obtained from continuous core samples collected during installation of six on-site monitoring wells and drilling of three soil borings during the Phase II field investigation. Core samples from each boring showed similar subsurface materials at each drilling location. A geologic cross section (Section A-A') showing the typical subsurface lithology, drawn northeast to southwest, is presented on Figures 3 and 4.

Cross Section A-A' illustrates that subsurface materials to approximately 30 to 40 feet below the ground surface consist of moderate to high permeability units of silty sands with lenses of cleaner sands and gravels. A unit of low to moderately low permeability silty clay with minor sandy and clayey silts is present at the 30 to 40-foot depth. The silty clay unit is approximately 10 to 15 feet thick and appears to be laterally continuous across the site. Beneath the silty clay are units of high permeability gravels and poorly graded sands to a depth

of at least 120 feet.

Ground water was encountered in each well borehole at approximately 70 to 95 feet below grade within a unit of gravels with varying sand and silt contents. A lens of sandy silt was encountered below the water table at Well CWMW-9 from approximately 88 to 94 feet below grade. The sandy silt lens was not encountered elsewhere on site, and the extent of this lens is unknown.

#### SOILS

Surface soils in the vicinity of the Cal West site are mapped by the USDA Soil Conservation Service (SCS) as the Nickel-Caliza association. Soils of this unit are deep, well-drained, very gravelly sandy loams formed in gravelly alluvium derived from rhyolitic tuff and lava. The SCS rates the hazard potential for this mapping unit as moderate for water erosion and high for wind erosion. In general, these soils support shrub and grass vegetation characteristic of dryland range.

Surface soils encountered during soil sampling activities at the Cal West site consisted predominantly of brown gravelly and very gravelly sandy loams associated with the Caliza soil series. Soils were observed to be calcareous throughout the site and slightly indurated zones of calcium carbonate accumulation were observed in some areas. The soil pH was approximately 8.0 in all soil horizons measured.

#### HYDROGEOLOGY

The Santa Fe Group and Quaternary deposits comprise the major water-bearing unit in the Socorro Basin. This aquifer system is divided into three hydrostratigraphic units: 1) the lower confined Popotosa aquifer; 2) the middle Popotosa confining unit; and 3) the upper unconfined shallow aquifer.

##### Popotosa Aquifer and Popotosa Confining Unit

The Popotosa aquifer corresponds with the lower fanglomerate facies of the Popotosa Formation. The lower Popotosa is well indurated and densely fractured near fault zones. Because the Popotosa aquifer is covered by a thick section of the Popotosa confining bed and the shallow aquifer in most of the Socorro Basin, the hydraulic properties of the Popotosa aquifer are not well known. The hydraulic conductivity of the lower aquifer is highly variable depending on the degree of cementation, volcanic alteration, sorting, and grain size distribution of the deposit.

The Popotosa confining unit corresponds to the playa deposits of the upper Popotosa Formation. The playa deposits consist of claystones, mudstones, siltstones, sandstones and conglomerates. The Popotosa confining unit probably has a low hydraulic conductivity because of the fine-grained nature of the deposit.

##### Shallow Aquifer

The upper shallow aquifer is composed of the Sierra Ladrones Formation and Quaternary deposits. The Sierra Ladrones aquifer is the most important source of ground water in the region. Sierra Ladrones deposits are composed of fine to coarse-grained sandstones and pebble conglomerate interfingering with beds of mud, silt, and sand. The Quaternary deposits consist primarily of conglomerates and sandstones. The thickness and extent of the shallow aquifer is estimated to be greater than 1,000 feet thick in the Socorro Basin. No wells in the Socorro and La Jencia Basins are known to be completed in zones deeper than the shallow aquifer.

## Regional Ground Water Circulation

Ground water flow in the northwestern Socorro Basin is dominated by two components: 1) an eastward component of flow associated with mountain recharge areas, and 2) a southern component of flow associated with the Rio Grande. Along the margins of the Socorro Basin, ground water in the shallow aquifer flows toward the river valley and away from mountain recharge areas. Within the inner-valley or floodplain of the Rio Grande, ground water flow is dominated by the river, conveyance channels, laterals, and drains in the irrigated part of the river valley. These two-flow systems interact extensively. Ground water flow within the inner-valley is generally parallel to the river at a gradient of approximately 0.001 (1 meter per kilometer).

## Site Hydrogeology

Information on the site hydrogeology was obtained from the three preexisting monitoring wells (CWMW-1, CWMW-2, and CWMW-3) and the six new monitoring wells installed during the Phase II field investigation (CWMW-4 through CWMW -9).

The depth to ground water beneath the Cal West site ranges from approximately 70 to 95 feet below grade. Sediments encountered in the saturated zone consist predominantly of poorly graded sands and gravels with varying sand and silt contents. Following well construction the static water level in the wells did not appear to change from the water levels encountered during drilling.

All of the monitoring wells were surveyed for top of casing elevations by the Bureau of Reclamation (BOR) on October 29, 1991. Stabilized water surface elevations for the monitoring wells were measured on October 28, 1991 and April 14, 1992 (Table 2). Ground water surface contours for the Cal West site for October 28, 1991 and April 14, 1992 are shown on Figures 5 and 6, respectively. The October 1991 contours indicate that shallow ground water beneath the site flows predominantly in a south-southwesterly direction at a gradient of approximately 0.0007 ft/ft. The April 1992 contours also show a south-southwest groundwater flow direction at a slightly flatter gradient of approximately 0.0005 ft/ft. Figures 5 and 6 both indicate that ground water flow is more southerly at the north end of the Cal West site. Measured water surface elevations for October 1991 were approximately 0.5 foot higher than April 1992.

**TABLE 2: WATER SURFACE ELEVATIONS FOR CAL WEST MONITORING WELLS MEASURED OCTOBER 1991 AND APRIL 1992**

MONITORING WELL	TOP OF CASING (feet,msl)	WATER SURFACE ELEVATION (feet, msl)	
		10-28-91	4-14-92
CWMW-1	4,711.901	4,616.86	4,616.27
CWMW-2	4,688.804	4,617.12	4,616.59
CWMW-3	4,702.366	4,616.59	4,616.19
CWMW-4	4,688.690	4,617.25	4,616.63
CWMW-5	4,700.628	4,616.94	4,616.50
CWMW-6	4,697.669	4,617.00	4,616.45
CWMW-7	4,703.775	4,616.77	4,616.27
CWMW-8	4,699.130	4,616.81	4,616.28
CWMW-9	4,716.212	4,616.55	4,616.11

DEMOGRAPHY AND SURROUNDING LAND USE

The area surrounding the Cal West site is rural and sparsely populated. Lemitar is the closest village and has an estimated population of 250 to 400 persons. The nearest residences to the site are located approximately 1,000 feet to the northeast and to the southeast in Lemitar, across Interstate 25. At least three households are located approximately 1,100 to 1,300 feet south of the fenced area and are the nearest residences south of the site.

Private lands in the immediate vicinity of the site are not irrigated; however, the inner valley of the Rio Grande located immediately east of I-25 is primarily agricultural. US Bureau of Land Management (BLM) property is located west and north of the Cal West property and is classified as grazing rangeland.

ECOLOGY

The area surrounding the site is marginal habitat for open land and rangeland wildlife. The US Soil Conservation Service (SCS) ranks soils in the area as fair to poor potential wildlife habitat (SCS, 1988). The area historically has been overgrazed by cattle. Both the temperature regime and rainfall distribution favor warm-season perennial plants in this area. The Cal West site and vicinity is dominated by drought-tolerant perennial and annual grasses, forbs, and woody species. The expected resident wildlife in the vicinity of the site are small mammals and reptiles, birds of prey, and small to medium sized birds.

NATURE AND EXTENT OF CONTAMINATION

In October 1990, the Environmental Protection Agency (EPA) and the New Mexico Environment Department (NMED) began the remedial investigation (RI) at the Cal West Metals site to

characterize environmental conditions, hazardous substances, pollutants, and contaminant migration pathways. The initial investigation (Phase I) was conducted to identify other (besides known lead contamination) potential contaminants at the site.

Specifically, the Phase I investigation was used to determine if organic contaminants were also present at the site in order to focus the comprehensive Phase II investigation and fully characterize the nature and extent of contamination. Work performed during the Phase I RI/FS included sampling and analysis of on-site battery waste piles, soils, and three site wells. The Phase II field investigation consisted of surface soil sampling, trenching, air sampling, installation of monitoring wells, residential and monitor well sampling, a field portable X-ray fluorescence (FPXRF) survey, and depth soil sampling. Field activities for the Phase I investigation were conducted on October 24, 1990, and Phase II was conducted from September 16, 1991 through October 30, 1991.

A summary and discussion of the analytical results obtained from samples collected at the Cal West Metals site during the Phase I and Phase II field investigations are presented in this document. Concentration for the Target Compound List (TCL) of organic compounds are reported in micrograms per kilograms, ug/kg, or parts per billion (ppb). Concentrations for the Target Analyte List (TAL) of inorganic compounds are reported in milligrams per kilograms, mg/kg, or parts per million (ppm). Tables provided in this section include chemical concentrations of all compounds analyzed and includes qualifier letters.

No volatile organic compounds were detected in the samples collected during Phase I and therefore they were not analyzed for during Phase II. Volatile test results are presented in Table 3. No cyanide was detected in any of the samples collected during Phase I and was not analyzed for in Phase II. Soil samples collected during Phase I were also analyzed for pesticides. Polychlorinated biphenyls (PCBs) were the only compounds detected in the pesticides analysis. PCBs detected were at concentrations below the Toxic Substances Control Act residential cleanup level of 1 ppm, 40 CFR Part 761, and therefore were not targeted in samples collected during the Phase II investigation. Pesticides test results from Phase I are presented in Table 4.

#### Background Data Summary

Background soil and surface sediment samples were collected during the Phase II field investigations. TAL test results for the background samples are presented in Table 5. Background concentrations for the chemicals of concern (COC) identified for the Cal West site in the Remedial Investigation Report were:

For the soil samples at the surface (0 to 6 inches depth): lead 49.2 ppm; arsenic 1.2 ppm; cadmium .41 ppm; mercury .10 ppm; nickel 13.8 ppm; and silver 1.3 ppm. Soil at a depth of 6 to 12 inches below ground surface: lead 15.2 ppm; arsenic 1.2 ppm; cadmium .47 ppm; mercury .10 ppm; nickel 12.1 ppm; and silver 1.2 ppm.

**TABLE 5: SOIL AND SEDIMENT BACKGROUND TAL TEST RESULTS (mg/kg or ppm)**

CLP No.	MFR012	MFR013	MFR014	MFR024
Site No.	XRFA1-0	XRFA1-9	XRFA1-18	SS10.5A
Location	Background	Background	Background	Drainage
Aluminum	10800.00	9650.00	11500.00	6630.00
Antimony	5.90 UR	6.30 BR	6.00 BR	2.60 UR
Arsenic	1.20 BJ	1.20 BJ	1.60 BJ	1.20 BJ
Barium	186.00	191.00	198.00	198.00
Beryllium	.79 B	.87 B	1.00 B	.29 B
Cadmium	.41 U	.47 B	.41 U	.46 BJ
Calcium	13300.00	25300.00	27900.00	8590.00
Chromium	10.40	8.00	9.70	8.10
Cobalt	7.80 B	7.30 B	8.00 B	7.00 B
Copper	17.00	15.30	16.50	20.60
Iron	18900.00	18500.00	22900.00	17700.00
Lead	49.20	15.20 J	10.30 J	31.20
Magnesium	5370.00	4670.00	5230.00	3430.00
Manganese	481.00	427.00	456.00	668.00
Mercury	.10 U	.10 U	.10 U	.10 U
Nickel	13.80	12.10	13.70	10.10
Potassium	3020.00 J	2490.00 J	2720.00 J	1940.00 J
Selenium	.82 UJ	.83 UJ	.82 UJ	.40 UJ
Silver	1.30 B	1.20 B	1.00 U	.40 U
Sodium	200.00 B	219.00 B	252.00 B	264.00 B
Thallium	.61 UJ	.62 U	.62 UJ	1.00 UJ
Vanadium	20.90	20.90	28.00	25.40
Zinc	73.80	63.60	72.80	66.50

Soil at a depth of 12 to 24 inches below ground surface: lead 10.3 ppm; arsenic 1.60 ppm; cadmium .41 ppm; mercury .10 ppm; nickel 13.7 ppm; and silver 1.0 ppm.

Background concentrations for the COCs in the sediment samples were: lead 31.2 ppm; arsenic 1.2 ppm; cadmium .46 ppm; mercury .10 ppm; nickel 10.1 ppm; and silver .40 ppm.

## Contaminant Waste Source Samples

Based on test results from the samples collected during the Phase I and Phase II field investigations, hazardous substance contaminant sources at the Cal West site include the broken battery waste piles, dried sludge waste sediments, and sediment materials from the evaporation ponds. Compounds detected in the samples collected from the battery piles were those compounds which are typically associated with battery recycling and recovery operations. Semivolatile organic compounds detected were predominately polynuclear aromatic hydrocarbons (PAHs) which are associated with plastics and rubber products. As expected, the major contaminant of concern found at the site was lead and at lower concentrations, other metals typically found with lead processing operations.

Inorganic test results from the broken battery piles and the concrete pad sludge sediments show concentrations of the COCs as follows: lead 836,000 ppm; antimony 1160 ppm; arsenic 240 ppm; cadmium 14.5 ppm; mercury .34 ppm; nickel 38.7 ppm; and silver 5.0 ppm. TAL test results are presented in Table 6.

Concentrations for the semi-volatile COCs were: 2-methyl naphthalene 6,600 ppb; acenaphthene 17,000 ppb; fluorene 4,700 ppb; anthracene 3,600 ppb; pyrene 12,000 ppb; benzo(a)anthracene 4,800 ppb; chrysene 3,500 ppb; benzo(b)fluoranthene 4,700 ppb; benzo(k)fluoranthene 1,100 J ppb; benzo(a)pyrene 2,800 ppb; indeno(1,2,3-cd)pyrene 970 ppb; and benzo(g,h,i)perylene 1,200 ppb. Semi-volatile test results are presented in Tables 7. All of these constitute hazardous substances as defined at CERCLA Section 101(14), 42 U.S.C. 9601(14), and further defined at 40 CFR 302.4.

Pond sediment samples collected from the two evaporation ponds indicated high concentrations of contaminants present at the surface. Depth samples collected do not indicate contaminant migration with depth. High contaminant concentrations were not found deeper than 3 feet below ground surface. Sediment samples from the lined pond are considered source waste materials since battery sludge waste and processing liquids with lead fines were disposed of in this pond. Some waste materials may have been disposed of in the unlined pond based on the high concentrations of contaminants found. Inorganic concentrations of the COCs found in the pond sediments were: lead 421,000 ppm; antimony 581 ppm; arsenic 250.3 ppm; cadmium 18.4 ppm; mercury 1.8 ppm; nickel 32.7 ppm; and silver 9.8 ppm. TAL test results are presented in Table 8. These inorganics constitute hazardous substances as defined at CERCLA Section 101(14), 42 U.S.C. 9601(14), and further defined at 40 CFR 302.4

No semi-volatile contaminants of concern were detected in the pond sediment samples. This would indicate that the semi-volatile contaminants are bound in the hard rubber and plastic hydrocarbon materials. Semi-volatile test results for the pond sediments are presented in Table 9.

## Soil and Drainage Sediment Samples

No organic contaminants were detected in the soil samples analyzed, not even the semi-volatile (PAHs) compounds found in the battery waste piles. This would further indicate that the PAHs in the source waste materials are not leaching and are bound to the plastics and hard rubber fractions of the source waste. Soil semi-volatile test results are presented in Table 10.

TAL inorganic and lead only test results for the soil samples collected are presented in Tables 11 through 14. The higher concentrations of contaminants were found in samples collected that visually contained battery waste material. Soil samples collected included surface (6 inches or less), shallow (not more than 3 feet), and depth (greater than 3 feet) samples.

Concentrations for the surface soils inorganic COCs were: lead 7690 ppm; antimony 101 ppm; arsenic 32 ppm; cadmium 4.1 ppm; mercury .11 ppm; nickel 13.4 ppm; and silver 2.1 ppm. Trench excavations were conducted in the southwest berm area to a depth of approximately five (5) feet below natural ground surface. TAL concentrations for the COC found in the site trenches were: lead 51,100 ppm; arsenic 704 ppm; cadmium 15.2 ppm; mercury .11 ppm; nickel 74.7 ppm; and silver 1.2 ppm.

Sediment samples were collected from the north and south drainage areas. Samples collected were analyzed for TAL inorganic compounds, results are presented in Table 15. Maximum concentrations for the COCs found in the drainage sediments samples were: lead 1,550 ppm; arsenic 15.7 ppm; cadmium .98 ppm; mercury .10 ppm; nickel 17.5 ppm; and silver 1.5 ppm. Contaminant migration off-site through the drainage pathways is to be expected since source waste materials are located in open areas at the site and no drainage controls or containment measures are being used.

TABLE 10 SOIL SEMI-VOLATILE TEST RESULTS (ug/kg or ppm)

CLP No.	FK883	FK884	FK887	FK888
Site	CWB-7	CWB-6	CWB-3	CWB-4
Location	Surface	Surface	Soil P.	Surface
Phenol	680. U	670. U	670. U	670. U
bis(2-Chloroethyl)Ether	680. U	670. U	670. U	670. U
2-Chlorophenol	680. U	670. U	670. U	670. U
1,3 Dichlorobenzene	680. U	670. U	670. U	670. U
1,4-Dichlorobenzene	680. U	670. U	670. U	670. U
Benzyl Alcohol	680. U	670. U	670. U	670. U
1,2-Dichlorobenzene	680. U	670. U	670. U	670. U
2-Methylphenol	680. U	670. U	670. U	670. U
Bis(2-Chloroisopropyl)Ether	680. U	670. U	670. U	670. U
4-Methylphenol	680. U	670. U	670. U	670. U
N-Nitroso-di-n-propylamine	680. U	670. U	670. U	670. U
Hexachloroethane	680. U	670. U	670. U	670. U
Nitrobenzene	680. U	670. U	670. U	670. U
Isophorone	680. U	670. U	670. U	670. U
2-Nitrophenol	680. U	670. U	670. U	670. U
2,4-Dimethylphenol	680. U	670. U	670. U	670. U
Benzoic Acid	3300. U	3300. U	3200. U	3300. U
bis(2-Chloroethoxy)methane	680. U	670. U	670. U	670. U
2,4-Dichlorophenol	680. U	670. U	670. U	670. U
1,2,4-Trichlorobenzene	680. U	670. U	670. U	670. U
Naphthalene	680. U	670. U	670. U	670. U
4-Chloroaniline	680. U	670. U	670. U	670. U
Hexachlorobutadiene	680. U	670. U	670. U	670. U
4-Chloro-3-methylphenol	680. U	670. U	670. U	670. U
2-Methylnaphthalene	680. U	670. U	670. U	670. U
Hexachlorocyclopentadiene	680. U	670. U	670. U	670. U
2,4,6-Trichlorophenol	680. U	670. U	670. U	670. U
2,4,5-Trichlorophenol	3300. U	3300. U	3200. U	3300. U
2-Chloronaphthalene	680. U	670. U	670. U	670. U
2-Nitroaniline	3300. U	3300. U	3200. U	3300. U
Dimethylphthalate	680. U	670. U	670. U	670. U
Acenaphthylene	680. U	670. U	670. U	670. U
2,6-Dinitrotoluene	680. U	670. U	670. U	670. U
3-Nitroaniline	3300. U	3300. U	3200. U	3300. U
Acenaphthene	680. U	670. U	670. U	670. U
2,4-Dinitrophenol	3300. U	3300. U	3200. U	3300. U
4-Nitrophenol	3300. U	3300. U	3200. U	3300. U
Dibenzofuran	680. U	670. U	670. U	670. U
2,4-Dinitrotoluene	680. U	670. U	670. U	670. U
Diethylphthalate	680. U	670. U	670. U	670. U
4-Chlorophenyl-phenylether	680. U	670. U	670. U	670. U
Fluorene	680. U	670. U	670. U	670. U
4-Nitroaniline	3300. U	3300. U	3200. U	3300. U
4,6-Dinitro-2-methylphenol	3300. U	3300. U	3200. U	3300. U
N-Nitrosodiphenylamine (1)	680. U	670. U	670. U	670. U
4-Bromophenyl-phenylether	680. U	670. U	670. U	670. U
Hexachlorobenzene	680. U	670. U	670. U	670. U
Pentachlorophenol	3300. U	3300. U	3200. U	3300. U

Phenanthrene	680.	U	670.	U	670.	U	670.	U
Anthracene	680.	U	670.	U	670.	U	670.	U
Di-n-butylphthalate	680.	U	670.	U	670.	U	670.	U
Fluoranthene	680.	U	670.	U	670.	U	670.	U
Pyrene	680.	U	670.	U	670.	U	670.	U
Butylbenzylphthalate	680.	U	670.	U	670.	U	670.	U
3,3'-Dichlorobenzidine	1400.	U	1300.	U	1300.	U	1300.	U
Benzo(a)anthracene	680.	U	670.	U	670.	U	670.	U
Chrysene	680.	U	670.	U	670.	U	670.	U
bis(2-Ethylhexyl)phthalate	680.	U	670.	U	1700.		510.	J
Di-n-octylphthalate	680.	U	670.	U	1800.		670.	U
Benzo(b)fluoranthene	680.	U	670.	U	670.	U	670.	U
Benzo(k)fluoranthene	680.	U	670.	U	670.	U	670.	U
Benzo(a)pyrene	680.	U	670.	U	670.	U	670.	U
Indeno(1,2,3-cd)pyrene	680.	U	670.	U	670.	U	670.	U
Dibenz(a,h)anthracene	680.	U	670.	U	670.	U	670.	U
Benzo(g,h,i)perylene	680.	U	670.	U	670.	U	670.	U

**TABLE 11: SOIL TAL TEST RESULTS (mg/kg or ppm)**

CLP No.	MFR001	MFR002	MFR003	MFR004
Site No.	XRFB7-0	XRFB15-0	XRFJ17-0	XRFJ20-0
Location	Grid Surf	Grid Surf	Grid Surf	Grid Surf
Aluminum	9390.00	11100.00	9070.00	12200.00
Antimony	7.50 BR	10.00 BR	6.70 BR	9.40
BR				
Arsenic	2.60 J	5.70 J	2.20 J	3.70 J
Barium	185.00	189.00	179.00	191.00
Beryllium	.78 B	.80 B	.71 B	.90 B
Cadmium	.51 B	1.00	.41 U	.77 B
Calcium	12900.00	13600.00	13100.00	14200.00
Chromium	9.40	11.60	7.70	12.20
Cobalt	7.90 B	8.10 B	7.20 B	8.80 B
Copper	28.40	21.00	18.80	21.70
Iron	22300.00	19700.00	18500.00	24800.00
Lead	45.60 J	2080.00	264.00 J	301.00
Magnesium	4640.00	5130.00	4850.00	5430.00
Manganese	561.00	501.00	491.00	556.00
Mercury	.10 U	.10 U	.10 U	.10 U
Nickel	12.50	13.30	10.80	13.40
Potassium	2210.00	3330.00 J	2580.00 J	3200.00 J
Selenium	.81 UJ	.81 UJ	.81 UJ	.81
UJ Silver	1.60 B	2.10	1.30 B	1.80 B
Sodium	208.00 B	189.00 B	247.00 B	339.00 B
Thallium	.60 U	.61 U	.61 U	.61 U
Vanadium	24.10	22.80	18.00	26.50
Zinc	81.20	82.50	81.70	89.60

CLP No.	MFR017	MFR011	MFR015
Site No.	XRFF10-0	XRFJ12-9	XRFF10-9
Location	Grid Surf	Grid 9" D	Grid 9"
Aluminum	9630.00	7200.00	8680.00
Antimony	7.70 BR	19.40 R	6.60 BR
Arsenic	4.30 J	17.60 J	2.00 BJ
Barium	178.00	293.00	166.00
Beryllium	.83 B	.72 B	.75 B
Cadmium	.70 B	2.80	.43 U
Calcium	20200.00	17600.00	22200.00
Chromium	8.70	6.60	7.50
Cobalt	7.10 B	7.00 B	7.50 B
Copper	17.80	19.50	13.50
Iron	19500.00	15200.00	16400.00
Lead	383.00 J	7150.00	26.80 J
Magnesium	4460.00	4080.00	4200.00
Manganese	442.00	984.00	551.00
Mercury	.11 U	.11 U	.10 U
Nickel	12.20	11.50	11.20
Potassium	2600.00 J	2240.00 J	2250.00 J
Selenium	.84 UJ	.84 UJ	.86 UJ
Silver	1.70 B	2.00 B	1.40 B

Sodium	232.00 B	242.00 B	216.00 B
Thallium	.63 U	.96 B	.64 U
Vanadium	21.90	17.80	19.60
Zinc	70.60	87.40	57.40

CLP No.	MFK485	MFK486	MFK481	MFK482
Site No.	CWB-3	CWB-4	CWB-7	CWB-6
Location	Soil Pile	Soil Surf	Soil Surf	Soil
Surf				

Aluminum	9050.00	10000.00	9790.00	7970.00
Antimony	49.80 J	101.00 J	6.10 UJ	48.10 J
Arsenic	32.00	31.30	4.30	21.00
Barium	216.00	288.00	171.00	141.00
Beryllium	.38 B	.41 B	.39 B	.34 B
Cadmium	1.50	4.10	.61 U	.56 B
Calcium	16400.00	17700.00	18100.00	14600.00
Chromium	12.20 J	38.20 J	10.30 J	10.90 J
Cobalt	7.30 B	9.00	8.20 B	7.20 B
Copper	28.50	51.70	13.50	17.30
Iron	20100.00	23200.00	22800.00	21200.00
Lead	7690.00	7140.00	72.40	2850.00
Magnesium	4050.00	8670.00	4520.00	4090.00
Manganese	557.00	480.00	438.00	417.00
Mercury	.08 U	.09 U	.10 U	.09 U
Nickel	12.40	16.50	11.50	12.80
Potassium	2670.00	2700.00	3090.00	2040.00
Selenium	.40 UR	.40 UR	.41 UR	.35
UR Silver	.99 UJ	.89 UJ	1.00 UJ	
.87 UJ				
Sodium	948.00 B	238.00 B	141.00 B	193.00 B
Thallium	.40 U	.40 U	.41 U	.35 U
Vanadium	20.70	24.40	22.70	23.10
Zinc	92.80	188.00	71.40	72.70
Cyanide	1.00 U	1.00 U	1.00 U	1.00 U

## Ground Water Samples

Ground water sampling was conducted during Phase I and Phase II of the RI field investigation to determine if a release of hazardous substances to ground water has occurred from site waste sources. Ground water samples were collected from preexisting monitoring well (CWMW-2) and the two site supply wells (CWSW-1 and CWSW-2) during the Phase I investigation in October 1990. Ground water sampling for the Phase II investigation was conducted in October 1991 and consisted of sampling six newly constructed wells (CWMW-4 through CWMW-9), three preexisting monitoring wells, and six domestic wells in the site vicinity. Monitoring well and domestic well locations are shown on Figures 7 and 8, respectively.

All ground water samples collected during the Phase I and Phase II investigations were analyzed for TAL metals by a Contract Laboratory Program (CLP) laboratory. Only unfiltered samples were targeted for the domestic wells and for wells sampled during the Phase I investigation. Both filtered and unfiltered samples were targeted for monitoring wells sampled during the Phase II investigation. The ground water analytical metal results for the Cal West monitoring wells are summarized in Table 16, and for the domestic and site supply wells in Table 17. Analytical results from sampling events prior to the RI are also included in Tables 16 and 17.

The TAL analytical results indicate that there has not been a release of hazardous substance metal contaminants from site waste sources to the ground water beneath the Cal West site. The primary contaminant of concern detected in site waste sources is lead. The Tucker domestic well is considered to represent background water quality upgradient of the Cal West site, and analysis of ground water from the Tucker well showed non-detectable lead levels (<0.002ppm). Monitoring well CWMW-4, which is located upgradient of all site waste sources, showed a ground water lead level of only 0.004 ppm. Lead levels detected in filtered samples from other newly constructed monitoring wells, including those immediately downgradient of site waste sources (CWMW-5, CWMW-7, and CWMW-9), are similar to those of the Tucker well and CWMW-4. Additionally, lead levels detected in all samples collected from newly constructed monitoring wells do not exceed the New Mexico ground water standard of 0.05 ppm or the EPA action level of 0.015 ppm (40 CFR 141 Subpart I).

Phase II analysis of unfiltered samples from preexisting monitoring wells CWMW-1, CWMW-2, and CWMW-3 showed slightly elevated lead levels of 0.090, 0.043, and 0.035 ppm, respectively. Filtered samples from these wells all showed lead levels of less than 0.008 ppm. The elevated lead levels detected in the unfiltered samples are a result of the high amounts of sediment encountered during sampling of these wells, and are not indicative of a release of lead to ground water beneath the site. Background soil and sediment samples collected during the Phase II investigation indicate that lead is naturally occurring in the site vicinity at concentrations of approximately 10 to 15 ppm. Well CWMW-1 was not completed with a gravel pack to prevent sediments from entering the well screen, and reportedly none of the preexisting wells were properly developed following construction to remove sediments. The unfiltered sample from well CWMW-9 showed a slightly elevated lead concentration at the action level of 0.015 ppm, which may also be due to a higher sediment concentration compared to other newly constructed monitoring wells. The unfiltered sample from well CWMW-9 showed a lead concentration below the detection limit of 0.002 ppm.

Lead concentrations detected in ground water samples collected from the domestic wells ranged from nondetected (<0.002 ppm) to 0.006 ppm, which are well below New Mexico (New Mexico Water Quality Act, Chapter 326) and EPA ground water standards (Clean Water Act, U.S.C. 1251 et. seq.). The closest domestic wells down-gradient of the site, the Gutierrez and Jaramillo wells, showed nondetectable lead concentrations.

Other metals detected in concentrations exceeding New Mexico or EPA ground water standards

during the RI field investigation include aluminum, barium, iron, and manganese which are hazardous substances as defined at CERCLA Section 101(14), 42 U.S.C. 9601(14), and further defined at 40 CFR 302.4. Aluminum concentrations exceeded New Mexico aesthetic and EPA aesthetic water quality standards of 5.0 and 0.2 ppm, respectively, in unfiltered samples collected from monitoring wells CWMW-1, CWMW-2, CWMW-3, CWMW-8, and CWMW-9. Barium concentrations exceeded the New Mexico (New Mexico Water Quality Act, Chapter 326) of 1.0 ppm and EPA's MCL (40 CFR 141 and 142) of 2.0 ppm in unfiltered samples from monitoring wells CWMW-1 (12.0 ppm), CWMW-2 (2.49 ppm), CWMW-3 (11.3 ppm), and CWMW-9 (1.24 ppm). None of the filtered samples exceeded ground water standards for aluminum or barium. The Tucker domestic well, located approximately 2,000 feet north of the site, showed metal concentrations similar to those detected in filtered monitoring well samples.

Concentrations of iron and manganese were found to be elevated above New Mexico's aesthetic ground water standards in both filtered and unfiltered samples from almost all site monitoring wells and most domestic wells sampled. The New Mexico ground water standards for iron and manganese are 1.0 ppm and 0.2 ppm, respectively. The EPA MCLs (40 CFR 143) for iron and manganese are 0.3 ppm and 0.05 ppm, respectively. Iron concentrations in domestic well and filtered monitoring well samples ranged from less than 0.011 ppm to 0.765 ppm. Manganese concentrations detected in domestic well and filtered monitoring well samples ranged from 0.104 ppm to 1.47 ppm. Elevated iron and manganese levels appear to represent background water quality in the vicinity of the Cal West site, based on analytical results from all of the domestic wells sampled, including those both upgradient (Tucker well) and downgradient (Gutierrez and Jaramillo wells) of the site.

Ground water samples collected during the Phase I investigation and from wells CWMW-5, CWMW-7, and the Tucker well during the Phase II investigation were additionally analyzed for TAL organic compounds using a CLP laboratory. The analytical results did not indicate the presence of volatile or semivolatile organic compounds in ground water beneath the Cal West site. The analytical results showed trace concentrations of some semivolatile compounds. However, these compounds were also associated with the laboratory blanks.

Ground water samples collected during the Phase II investigation from monitoring wells and domestic wells were additionally analyzed for general water quality parameters at the Bureau of Reclamation Laboratory in Alamosa, Colorado. The results of the general water quality analyses are summarized in Table 18. The analytical results show that ground water in the vicinity of the Cal West site is generally high in total dissolved solids (TDS) and of relatively poor quality. All samples analyzed exceeded EPA's (40 CFR 143) water quality standard of 500 ppm for TDS. TDS concentrations in on-site monitoring wells ranged from 702 to 1,370 ppm, and were generally higher than TDS concentrations in domestic wells, with the exception of the Bailey well sample (1,520 ppm). Analytical results also indicate that ground water in the site vicinity contains elevated levels of sulfate. Sulfate concentrations exceeded EPA's (40 CFR 143) water quality standard of 250 ppm in most monitoring well samples and also in the Bailey well sample (593 ppm). The slightly higher sulfate and TDS concentrations detected in monitoring well samples may be related to the higher quantity of sediments encountered in these wells.

An elevated nitrate concentration of 64.88 ppm was detected in the ground water sample collected from monitoring well CWMW-8, which exceeds the New Mexico standard and EPA MCL (40 CFR 141 and 142) for nitrate of 10 ppm. Elevated nitrate levels were not detected in any other monitoring or domestic well sampled. Cal West's septic system may be the source of elevated nitrate at well CWMW-8.

Air Samples

A total of twenty two (22) air samples were analyzed for total suspended particles (TSP) and twelve (12) for selected semivolatile compounds (PAHs). Twelve (12) metals, including lead, were analyzed with the TSP samples. Lead test results are summarized in Table 19. Air samples were analyzed for the following contaminants which are hazardous substances as defined at CERCLA Section 101(14), 42 U.S.C. 9601 (14), and further defined at 40 CFR 302.4:

METALS	METALS	PAH	PAH
Lead	Nickel	Naphthalene	Indeno(1,2,3)pyrene
Cadmium	Selenium	Acenaphthene	Acenaphthylene
Chromium	Arsenic	Phenanthrene	Fluoranthene
Mercury	Iron	Pyrene	Anthracene
Silver	Manganese	Chrysene	Benzo(a)Anthracene
Copper	Zinc	Benzo(a)pyrene	Benzo(b)Anthracene
		Benzo(g,h,i)perylene	

Air sampling results (based on sampling conditions encountered) indicate that semivolatile compounds do not appear to present a potential to be emitted in significant concentrations from source waste piles in the form of wind blown particulates or soil/dust particles. The presence of lead was detected in most air samples collected during the RI activities. However, in one sample, the lead concentration detected was above the National Ambient Air Quality Standard (NAAQS) of 1.5 micro-grams per cubic meter (ug/m<sup>3</sup>) of air (40 CFR 50.12). Air sampling results indicate that there is a potential for lead-contaminated soil/dust to migrate off-site, particularly when conducting activities that disturb site soils and source waste piles.

#### EXTENT OF CONTAMINATION

##### Source Waste

The source waste materials at the Cal West site are confined to specific locations within the fenced area. The broken battery piles and dried sludge sediments are located adjacent (west) to the old cotton gin building on a concrete surface slab. Additional broken battery waste materials are stored inside the cotton gin building. The other source waste materials are sediments located in the evaporation ponds. The source waste materials cover a surface area of approximately 6,700 square feet (ft<sup>2</sup>). It is estimated that approximately 2,700 cubic yards (yd<sup>3</sup>) of source waste material will be remediated at the Cal West site. These materials include the broken battery waste piles, dried sludge waste sediments, and the evaporation pond sediments.

##### Soils and Sediments

Based on the RI investigations, soil contamination at the site is predominately found at the surface (depth of 6 inches or less). High (above 500 mg/kg) lead levels were found at a depth of 12 inches (average of 9 inches) at only four sampled location and at a depth of 24 inches (average of 18 inches) at two locations. Lead contamination above the cleanup level of 640 mg/kg(ppm) is found at the Cal West site on approximately 8.0 acres. At trench locations, high lead levels were found in samples collected at the surface and at depths of 2.0 and 2.5 feet. Although indications of buried waste materials were not found, there were isolated pockets of source wastes (broken battery pieces) resulting from site grading activities and disposal of household wastes. It is estimated that approximately 12,000 yd<sup>3</sup> of contaminated site soils will be remediated. Site soils include surface soils, drainage sediments, trenched areas, and the soil pile located west of the lined evaporation pond.

##### Ground Water

Ground water samples collected from the newly constructed site monitoring well and the residential wells do not indicate a release of hazardous substances, pollutants, or contaminants associated with the Cal West site to the ground water. Furthermore, depth samples collected at the two evaporation ponds and adjacent to the sludge waste sediments (concrete pad) do not indicate that lead or other hazardous substances, pollutants, or contaminants have migrated with depth.

## CONTAMINANT FATE AND TRANSPORT

### Factors Affecting Contaminant Migration

The fate and transport of contaminants from a source are dependent upon the physical and chemical properties of the waste constituents and the characteristics of the environmental media. The physio-chemical properties of solubility and sorption potential deal with reactions of the contaminants and the surrounding environmental media.

The chemical and biological transformation processes deal with chemical conversion from one form to another or degradation of the chemical by the surrounding environment.

The following chemicals of concern (COCs) have been identified for the Cal West Metals site: lead, antimony, arsenic, cadmium, mercury, nickel, silver, and polynuclear aromatic hydrocarbons (PAHs). All of these chemicals constitute hazardous substances as defined at CERCLA Section 101(14), 42 U.S.C. 9601(14), and further defined at 40 CFR 302.4. The general properties for these compounds are discussed below:

The PAHs are characterized by very low solubilities, low vapor pressures and Henry's Law Constants, and high partition coefficient ( $K_{oc}$ ) values. This indicates that the predominant transport mechanism for PAH compounds is through adsorption to organic carbon in soils. PAHs may be transported in an aqueous media but because of their very low solubilities they do not dissolve in water but exist in a particulate state.

Inorganic fate and transport depends on many conditions found in the environment. Precipitation of inorganics onto soil or dissolution of inorganics into the ground water depends greatly upon the oxidation states of the inorganics and the pH of the environment. Dissolution of inorganics into water generally occurs when either a low pH (<4) or a high pH (>10) exists. Inorganics generally precipitate with moderate pH levels. This precipitation causes the inorganics to either be held to soil through adsorption or to form colloidal particles which continue to flow with the aqueous environment. In ground water these colloidal particles tend to move slower than the water velocity or become trapped in the soil pores due to the size of the particles. In surface water, the colloidal particles will generally move with the water velocity as suspended particles. Inorganics which do not precipitate in the water exist as ions and move with the same velocity and direction as the water.

### Potential Routes of Migration

The source waste materials and pond sediments contain potentially leachable inorganic contaminants which can migrate to off-site locations. This is indicated from the results of the RI field investigation that show contaminants in drainage sediments and surface soil samples. Contaminant migration is occurring from the site in sediments through surface water runoff and through air in the form of wind blown particle/dust. Sediment samples collected from the drainage pathways show high inorganic levels consist with compounds found in the source waste materials. Air samples collected detected lead, and in one sample, the lead concentration exceeded NAAQS level. This would indicate that under high wind conditions and/or disturbance of source wastes materials, contaminants could migrate through wind blown particles/dust. In

addition, high lead levels were found in off-site surface soils in the predominate downwind location (north of fence area).

Semivolatile (PAHs) organic compounds were only detected in the source waste materials. No semivolatile contaminants were detected in the surface soils, on- or off-site, or the air samples collected during the RI field investigations. These findings indicate that the semivolatile compounds are bound in the broken battery materials which include plastics and hard rubber.

The ground water table at the site is located approximately 80 feet below ground surface. Site soils are naturally alkaline with a pH of 8.0, even at depth, and therefore have strong sorptive and low leachability characteristics. Precipitation at the site is low (less than 10 inches per year) and a high rate of evaporation exists. These factors would indicate a low potential for inorganic compounds to migrate to the ground water. No ground water contamination associated with Cal West site contaminants is indicated from ground water samples collected. In addition, no indication of contaminant migration with depth was found in the soil samples collected from the two evaporation ponds and adjacent to the sludge waste sediments (concrete pad).

Contaminant Persistence of inorganic contaminants will be discussed using the compounds identified as contaminants of concern at the Cal West site. These contaminants include lead, antimony, arsenic, cadmium, mercury, nickel, and silver. The inorganic contaminants identified at the site have their own relative toxicity and persistence values. Inorganics are not biodegradable but microbiological activity may increase the mobility of some metals. Inorganics will either be permanently bound by precipitation, ion exchange, or adsorption or will move in an aqueous environment.

Lead is strongly adsorbed to soil particles, and very little is transported into surface water or ground water (EPA, 1986a, as pointed in Technical Resources, Inc. (TRI), 1988). In surface water, lead has a tendency to form low soluble compounds with anions in the water. The undissolved form is carried in the waters by colloidal particles in the water (TRI, 1988).

Arsenic is extremely mobile in aquatic systems. Sorption onto clays, iron oxides, and organic materials in sediments is an important fate of arsenic in surface waters. Aerobic and anaerobic microorganisms can cause release of sediment-bound arsenic into the water column of soil-bound arsenic into the air. Thus the sediment-bound arsenic may act as a secondary source of contamination to the surface water. Arsenic in soil is usually in an insoluble, adsorbed form [EPA, 1982b, as cited in Life Systems Inc. (LSI,1987)], especially soils high in clay and iron oxides.

Mercury is strongly bound to particulates and organic matter in soil and sediments. The water solubility is low, so in aquatic systems most inorganic mercury is associated with sediments. Ionic soil mercury distributions are controlled primarily by organic matter. Aerobic microbiological processes mobilize mercury by methylation of inorganic forms.

Cadmium is very mobile in the environment. It is absorbed or complexed onto soil and hydrous metal oxides but less strongly than copper, zinc, and lead. The removal of dissolved cadmium by sorption processes is more effective as pH increases. Cadmium complexed with carbonate materials or hydrous metal oxides is less mobile than cadmium sorbed to clay particles or organic materials.

## **VI. SUMMARY OF SITE RISKS**

The baseline risk assessment provides the basis for taking action and indicates the exposure pathways that need to be addressed by the remedial action. It serves as the baseline indicating

what risks could exist if no action were taken at the site. This section of the ROD reports the results of the baseline risk assessment conducted for this site as part of the Remedial Investigation. The baseline risk assessment for the Cal West site was divided into two parts: the human health risk assessment and the ecological risk assessment.

#### HUMAN HEALTH RISKS

This human health risk assessment is a quantitative estimate of the current and potential risks to human health from exposure to hazardous substances, pollutants, or contaminants from the Cal West site. In accordance with the Risk Assessment Guidance for Superfund, Volume I, Human Health Evaluation Manual (EPA, 1989), the objectives of the evaluation process are: 1) to provide an analysis of baseline risk and help determine the need for remedial action at the site; 2) to provide a basis for determining concentrations of chemicals that can remain onsite and still adequately protect public health; 3) to provide a basis for comparing potential health impacts of various remedial alternatives; and 4) to provide a consistent process for evaluating and documenting public health threats at the site. This evaluation will also compare risks based on future use scenarios for the site.

The parts of this human health risk assessment will include the following:

- 1) Identification of Contaminants of Concern. Hazardous Substances, pollutants, or contaminants detected on or near the site are identified and their abundance and distribution in environmental media are evaluated to identify contaminants of potential concern that will be carried through the evaluation.
- 2) Exposure Assessment. Pathways of human exposure to contaminants of concern are evaluated for exposure potential.
- 3) Toxicity Assessment. Health effects and toxicity information are identified for each contaminant of concern. For carcinogens, slope factors are identified. For systemic toxicants (non-carcinogens), EPA reference doses are identified. For lead, contaminant levels are compared to results from the EPA Uptake/Biokinetic model.
- 4) Risk Characterization. For each exposure pathway, contaminant intake is calculated for each contaminant of concern. These intakes can then be compared to slope factors and reference doses to calculate potential long-term risk. Risks are then compared for different future use scenarios for the site.
- 5) Uncertainty Assessment. Uncertainties associated with toxicity assumptions and calculations are discussed, and a qualitative evaluation made as to the effect of these uncertainties on estimation of site risks.

#### Identification of Contaminants of Concern

This section will identify those chemicals which will be used to develop an exposure assessment. Samples were collected of ground water, soil, air, waste sources, and sediments in the dry arroyos draining the site. Samples were analyzed for Target Analyte List (TAL) metals. Two battery waste piles, the ponds, water within a sump inside the building, soils within the fenced area, ground water, and air were also sampled and analyzed for semivolatile organic compounds. Waste samples are particulates and will be evaluated in the soil exposure pathway. Since water rarely flows in the arroyos, those sediments will also be evaluated in the soil exposure pathway.

For all pathways, the following criteria were used in selecting chemicals for use in the risk assessment: 1) Analyses qualified with "R" (reject) were not used; 2) Those data qualified with "U" (undetected) were used at the detection limit if other samples showed concentrations above detection limit; 3) Chemicals detected in fewer than three samples in the soil pathway were not included; 4) Chemicals which pose a very low risk were not included in calculating total risk; 5) For exposure assessment, when more than four data points were usable, concentrations used were Reasonable Maximum Exposure levels for contaminants other than lead and the geometric mean for lead. When four or fewer data points were usable, the maximum concentration found was used.

#### Ground Water Samples

Ground water was sampled in two phases from monitor wells onsite and from six residential wells off-site. Samples were analyzed for Target Analyte List (TAL) metals, with additional ground water samples analyzed for semivolatile and volatile organic compounds.

No chemicals of concern were found in concentrations greater than EPA Maximum Contaminant Levels (MCLs) in filtered monitoring well samples and unfiltered residential well samples. The data do not suggest a release to ground water of hazardous substances, pollutants, or contaminants from the site. Since the ground water is not a complete pathway, no risk analysis was completed.

#### Waste Samples

Samples were collected from all waste sources onsite, including the concrete pad area, the lined pond, the unlined pond, and the battery waste pile. Selected samples were analyzed for Target Analyte List (TAL) metals. Remaining samples were analyzed for lead only. Additional samples were analyzed for semi-volatile organic compounds.

Chemicals were considered at elevated levels when concentrations were greater than three times background soil concentrations or, if background analyses were qualified with "R", when concentrations were greater than three times detection limit. Background for comparison to waste samples was the same as used for soil samples. Only laboratory analyses were used to determine lead concentrations; no portable x-ray fluorescence (XRF) data were included.

Contaminants of concern found identified in the waste sources include antimony, arsenic, cadmium, mercury, lead, silver, and semi-volatile organic compounds, especially polynuclear aromatic hydrocarbons (PAHs). The concrete pad source contained elevated levels of antimony, arsenic, cadmium, lead, and silver. Samples from the unlined pond were elevated in antimony, arsenic, cadmium, lead, and mercury. The lined pond contained elevated levels of antimony, arsenic, cadmium, lead, mercury, nickel, and silver. Samples from the waste pile and concrete pad were elevated in arsenic, lead, and semi-volatile organic compounds, especially PAHs. In soils, elevated levels of contaminants were found only in shallow samples. Samples from borings displayed decreasing concentrations with depth, with no elevated levels from samples deeper than eight feet. For risk assessment, only samples from 2.5' depth and less are used, since this is the assumed maximum depth of exposure in a residential or current use scenario, and only those contaminants which were elevated in three or more samples included.

#### Soil Samples

Soil samples were collected at the ground surface and up to a depth of nine inches at selected grid locations based on portable XRF readings or location of disturbed features on-site. Samples were also taken from soil borings and within trenches cut into the berm.

For risk assessment in the soil pathway, the site will be divided into two areas, inside the fence (site workers) and outside the fence. Samples from trenches within the berm on-site are

included as soil samples, since the berm was created by scraping soil from site grounds.

Hazardous substances, pollutants, or contaminants found in soil samples within the fenced area include arsenic, cadmium, lead, nickel, selenium, thallium, and zinc. Nickel, zinc, selenium and thallium were not included in the risk calculations since were not found in three or more samples.

The arroyos draining the site are dry for most of the year. Therefore, the potential exposure for this route would be primarily from contact with sediments. For this reason, sediment samples are included in the soil pathway evaluation. Lead was the only contaminant of concern detected at elevated levels within the sediment samples.

#### Air Samples

Air monitors were installed around the site to sample particulate and semi-volatile air emissions. Sampling was conducted with undisturbed site conditions to evaluate risk for the site during current and future use, and during trench excavations, to use in future evaluation of hazard presented during remediation activities. For this risk assessment, only samples taken during undisturbed site conditions are used, in order to assess risk under reasonable current and future use conditions.

Lead was present in most of the high volume samples. No other metals or semi-volatile organic compounds were detected in significant concentrations. It should be noted that winds were light to moderate during this sampling period, so air releases may increase under more severe winds.

#### Exposure Assessment

Exposure is defined as the contact of an organism (a human for this assessment) with a chemical or physical agent (EPA, 1988). A complete exposure pathway requires: 1) a chemical of concern at elevated levels which may be hazardous, 2) a route of exposure that allows the organism to come into contact with the hazardous substance, and 3) an exposed individual or population. An exposure assessment is the determination of the magnitude, frequency, duration, and route of exposure (EPA, 1989).

The National Oil and Hazardous Substances Pollution Contingency Plan (NCP) calls for the development of a current exposure scenario as well as a reasonable maximum exposure (RME) scenario, which for the Cal West site would be residential. For contaminants other than lead, this risk assessment considers the following routes of exposure: 1) ingestion of soil and sediment and 2) dermal contact with soil and sediment. Intakes will be calculated using the equations provided in the Risk Assessment Guidance for Superfund, Volume I, Human Health Evaluation Manual (EPA, 1989), with factors modified where necessary to conform to the Superfund risk assessment peer review committee Standard Operating Procedures (4-23-92), the Region VI risk assessment peer review committee Draft Supplemental Region VI Risk Assessment Guidance (4-14-92), and EPA Office of Solid Waste and Emergency Response Directive 9285.6-03 Standard Default Exposure Factors. Preference is given to factors proposed in the Region VI document.

The sump which was sampled on-site is isolated by a grate and is inaccessible. Therefore, no exposure pathway exists for this waste source. Ground water samples had no contaminants above MCL standards, and this route of exposure was not included in the risk calculations. Similarly, air monitoring showed no non-lead contaminants at elevated levels, and therefore the air route of exposure and inhalation of soils were not included in the risk calculations. Surface water is intermittent and was not available for sampling, so this pathway will not be evaluated.

For exposure related to lead, this risk assessment utilizes the Uptake Biokinetic Model, Lead

Version 0.5 (EPA, 1991), a PC-based model which estimates the probability of blood-lead levels based on environmental exposures. This model considers the following exposure routes: 1) ingestion of soil and dust, 2) ingestion of water, 3) ingestion of food, 4) inhalation of air, 5) exposure of a fetus through the maternal route, and 6) ingestion of paint chips (this last not applicable to the Cal West site).

#### Current Use

Current land use information was determined by site inspection during the Remedial Investigation. The site is presently closed and locked, and surrounded by a fence, although elevated lead concentrations were found in soils and sediments outside the fence. Historically, the facility was used as a battery recycling plant. The current use of the site is an industrial facility.

For industrial use, the exposure assessment assumes a chronic exposure of non-carcinogenic chemicals for 250 days per year for 25 years. This scenario considers only soil concentrations within the fenced area. Because the UBK model for lead considers only children in the exposure, lead cannot be included as a contaminant in the exposure assessment for the industrial scenario.

Risk values for trespassers were lower than those for on-site workers. Therefore, for current use, risk calculations were done for the more conservative on-site worker scenario. Remediation which reduces risk to acceptable levels for worker and residential scenarios will also reduce risk for trespassers.

#### Reasonable Maximum Future Use

Possible future land use was determined through interviews with local residents and the Socorro County manager. There are no zoning ordinances for this part of the county. Residences are presently located within 0.4 miles of the site on the same side of the interstate highway. A reasonable optimal future use of the site is for residential development.

A residential scenario assumes a chronic exposure to non-carcinogenic chemicals and exposure to carcinogens for 350 days per year for 30 years. Exposure due to lead is calculated based on the UBK model. This scenario considers soil concentrations both in and outside the fenced area.

#### Toxicity Assessment

Slope Factors (SFs) have been developed by EPA's Carcinogenic Assessment Group for estimating excess lifetime cancer risks associated with exposure to potentially carcinogenic contaminants of concern. Sfs, which are expressed in units of (mg/kg-day)<sup>-1</sup>, are multiplied by the estimated intake of a potential carcinogen, in mg/kg-day, to provide an upper-bound estimate of the excess lifetime cancer risk associated with exposure at that intake level. The term "upper bound" reflects the conservative estimate of the risks calculated from the SF. Use of this approach makes underestimation of the actual cancer risk highly unlikely. Slope factors are derived from the results of human epidemiological studies or chronic animal bioassays to which animal-to-human extrapolation and uncertainty factors have been applied (e.g., to account for the use of animal data to predict effects on humans).

Reference doses (RfDs) have been developed by EPA for indicating the potential for adverse health effects from exposure to contaminants of concern exhibiting non-carcinogenic effects. RfDs, which are expressed in units of mg/kg-day, are estimates of lifetime daily exposure levels for humans, including sensitive individuals. Estimated intakes of contaminants of concern from environmental media (e.g., the amount of contaminants of concern ingested from contaminated drinking water) can be compared to the RfD. RfDs are derived from human epidemiological studies

or animal studies to which uncertainty factors have been applied (e.g., to account for the use of animal data to predict effects on humans)

Reference doses and slope factors for the risk assessment conducted for the Cal West site were obtained from the Integrated Risk Information System, PC-based version (IRIS2) and the Superfund Chemical Data Matrix Tables (SCDM), Update 11 (EPA, 1991).

The EPA has developed a carcinogen classification system that uses a weight-of-evidence approach to classify the likelihood of a chemical being a human carcinogen. Information considered in developing the classifications includes human studies of the association between cancer incidence and exposure, and long-term animal studies under controlled laboratory conditions. Other supporting evidence considered includes short-term tests for genotoxic, metabolic and pharmacokinetic properties, toxicological effects other than cancer, structure-activity relationships, and physical and chemical properties of the chemical. Carcinogens are classified as follows:

- Group A: Human carcinogen - sufficient evidence of carcinogenicity in humans.
- Group B: Probable human carcinogen: B1 - limited evidence of carcinogenicity in humans; B2 - sufficient evidence of carcinogenicity in animals but inadequate evidence in humans.
- Group C: Possible human carcinogen - limited evidence of carcinogenicity in animals and inadequate or lack of human data.
- Group D: Not classifiable as to human carcinogenicity, with inadequate or no evidence.
- Group E: Evidence of non-carcinogenicity for humans.

#### Inorganic Chemicals

**Antimony.** Chronic exposure from inhalation of antimony results in respiratory dysfunction which can be severe. It can also be toxic through ingestion and acts as an irritant on skin. Sub-chronic and chronic oral Rfd for antimony is 0.0004.

**Arsenic.** Toxicity is dependent on the form of the compound. Chronic exposure from ingestion or inhalation can result in damage to liver, circulatory, or digestive systems. Sub-chronic and chronic oral RfD for arsenic is 0.0003. Arsenic is classified as a Group A human carcinogen, with an oral slope factor of 0.0018 and an inhalation slope factor of 15.

**Cadmium.** Chronic exposure to cadmium can result in kidney dysfunction. Acute toxicity is severe, although at levels much higher than those that have been detected at the Cal West site. Cadmium has also been classified as a probable human carcinogen (Group B1) by the inhalation route. Oral RfD for cadmium is 0.0005 and the inhalation slope factor is 6.3.

**Lead.** Lead can have profound adverse effects on certain blood enzymes and on aspects of neurological behavior. Children have been found to develop symptoms at lower blood-lead levels than adults. Adverse effects may occur at blood-lead levels so low as to be essentially without a threshold. For this reason, lead RfDs are not currently used. Lead is also considered a B2 probable human carcinogen. Lead contaminant levels are combined in a computer program based on the Uptake Biokinetic Model (EPA, 1991) to determine a distribution function of blood-lead levels in children.

**Mercury.** Mercury compounds produce mild to severe damage to the central nervous system and the mouth and gums. It can occur in both inorganic and organic compounds, with the organic form the

most toxic. Oral RfD for mercury is 0.0003 and inhalation RfD is 0.000086.

Nickel. Nickel tends to act locally in the human body, affecting the dermatological and respiratory systems. Oral RfD for nickel is 0.02. Nickel refinery dust is classified as a Group A human carcinogen by inhalation and has an inhalation slope factor of 0.84.

Selenium. Excess selenium can cause a garlic odor of breath and urine, thickened and brittle nails, loss of hair and nails, lower hemoglobin levels, mottled teeth, skin lesions, and neurological effects. Oral RfD for selenium is 0.005.

Silver. Silver in the skin creates permanent pigmentation. Silver compounds can irritate skin and mucous membranes, cause severe eye irritation, and may be lethal if ingested. Oral RfD for silver is 0.005.

Thallium. Nerve damage may result from ingestion. Thallium compounds can be extremely toxic, with effects on the nervous system, skin, and cardiovascular tract. The effects are cumulative. Reproductive organs and fetuses are highly susceptible. Oral RfD for thallium is 0.00008.

Zinc. Zinc is an essential element in the human diet. Zinc compounds generally have very low toxicity and are only harmful in high concentrations. Some zinc salts are carcinogenic, although these types of compounds have not been identified at the site. Oral RfD for zinc is 0.2.

#### Organic Chemicals

Bis(2-ethylhexyl) phthalate. This has an oral RfD of  $2.0 \times 10^{-3}$ . It is classified as a probable human carcinogen (Group B2) with oral slope factor of  $1.4 \times 10^{-2}$ .

Polynuclear Aromatic Hydrocarbons (PAHs). PAHs are a complex class of compounds which includes chemicals found at the Cal West site including acenaphthene, anthracene, benzo(a)anthracene, benzo(b)fluoranthene, benzo(k)fluoranthene, benzo(a)pyrene, benzo(g,h,i)perylene, chrysene, fluorene, 2-methyl naphthalene, indeno(1,2,3-c,d) pyrene, and pyrene. The oral reference dose for PAHs is based on benzo(a)pyrene toxicity and is  $4.0 \times 10^{-3}$  mg/kg/day. PAHs are classified as probable human carcinogens (Group B2). They are absorbed through the gastrointestinal tract, skin, and lungs. The slope factors are based on the carcinogenicity of benzo(a)pyrene, which has oral SF of 11.5 and inhalation SF of 6.1.

Phenol- Phenol has an oral RfD of 0.60.

Butylbenzyl phthalate- This can produce significant increase in liver weight. The sub-chronic and chronic reference dose is through the oral route, with an oral RfD of 0.20.

Di-N-butyl phthalate- The oral RfD for di-n-butyl phthalate is 0.10.

Di-N-octyl phthalate- The oral RfD for di-n-octyl phthalate is  $2.0 \times 10^{-2}$ .

4-Nonyl phenol- Oral RfD is 0.60.

Hexachlorocyclopentadiene- Exposure is by oral and inhalation routes. Oral RfD is  $7.0 \times 10^{-3}$  and inhalation RfD is  $2.0 \times 10^{-5}$ .

Fluoranthene- Health effects include nephropathy, increased liver weight, and hematological effects. Oral RfD is 0.04.

#### Calculated Intake

Contaminant intake is calculated using the equations outlined in the Risk Assessment Guidance for Superfund (EPA, 1989). The equations take into account contaminant concentration, amount of exposure, and body weight, averaged over exposure time. Other variables are specific to each medium considered. For the Cal West site, non-lead contaminants are examined for exposure within the soil pathway, by ingestion, and through dermal exposure routes. Only the soil pathway was included because analysis of samples from water and air showed no elevated levels of non-lead hazardous substances, pollutants, or contaminants in these media pathways.

Only samples of 0-2.5 feet depth were considered in the soil pathway. Areas considered were: 1) Soils within the fenced area excluding waste sources and berm samples; 2) Soils from the berm; 3) Soils within the fenced area including waste sources and berm samples; 4) Waste sources (concrete pad, unlined pond, lined pond, waste pile); and 5) Soils outside the fenced area, including drainage sediments. All areas were used in calculating intakes for adults and children in a residential scenario; all areas except those outside the fence were used in calculating intakes for adults in a current use (worker) scenario.

Intakes were calculated for those non-lead hazardous substances, pollutants, or contaminants which appeared in concentrations greater than three times background levels. Soil concentrations used in the calculation of intake for an area were the maximum for areas which had fewer than five data points, and the Reasonable Maximum Exposure (RME) for those areas which had five or more data points. An RME is a statistical calculation which represents the 95% upper confidence limit of the lognormal mean of the data. It is a more conservative approach to determining intake, since the RME is greater than the average concentration.

#### Ingestion of Chemical in Soils

$$I = CS \times IR \times CF \times FI \times EF \times ED \\ BW \times AT$$

where I = Intake

CS = Chemical concentration in soil (mg/kg)

IR = Ingestion rate = 100 mg/d (resident adults); 200 mg/d (children); 50 mg/d (workers)

CF = Conversion factor =  $10^{-6}$  kg/mg

FI = Fraction ingested from contaminated sources

= 1.0 (residential in all cases; workers with entire area inside the fence considered)

= 0.2 (workers when individual sources considered, since exposure will be over whole site area for workers and there are a number of sources)

EF = Exposure frequency = 350 d/yr (residential); 250 d/yr (workers)

ED = Exposure duration = 30 yrs (residential adults); 25 yrs (workers)

BW = Body weight = 70 kg (adult); 15 kg (children 1-6) AT = Averaging time = 365 x ED (chronic); 365 x 70 (carcinogens)

Results of intake calculations for ingestion of chemicals in soil are shown in Table 20.

#### Dermal Contact with Chemicals in Soil

$$CDI = CS \times CF \times SA \times AF \times ABS \times EF \times ED / BW \times AT$$

where CDI= Chronic daily intake (absorbed)  
SA = Skin surface area = 5000 cm<sup>2</sup> (adults); 1800 cm<sup>2</sup> (children)  
AF = Soil to skin adherence factor = 1.0 mg/cm<sup>2</sup>  
ABS= Absorption factor = 0.01 (1% of chemical on the skin is absorbed)

EF, ED, BW, AT are as in the ingestion equation.

Results of absorbed dose calculations for dermal contact with chemicals in soil are shown in Table 21.

#### Risk Characterization

Intakes for each contaminant of concern are compared for the soil ingestion and dermal contact pathways of exposure. Oral intakes and corrected (for absorption factors) dermal intakes are denoted by EPA as the chronic daily intake (CDI). Risk from lead will be treated separately using the Uptake/Biokinetic Model.

For non-carcinogens, it is assumed that the human body's protective mechanisms must be overcome before adverse effects are manifested. The amount of chemical which will exceed this value is called the threshold. A chronic Hazard Quotient (HQ) is calculated as the quotient of the contaminant-specific CDI by the contaminant-specific reference dose (RfD). The Hazard Quotients are then summed across the various pathways and media. A total Hazard Index of greater than 1 exceeds the threshold value and suggests a potential human health concern.

For carcinogens, it is assumed that any amount of chemical poses some hazard. Thus, there is no threshold value. A risk is calculated as the product of the contaminant-specific CDI and contaminant-specific slope factor. The potential upper-bound lifetime excess cancer risk (the additional risk of contracting cancer due to exposure to the contaminants of concern at the site) is estimated by summing the calculated risks for each contaminant in each pathway. EPA considers the acceptable excess risk from a site to be within the range  $10^{-4}$  to  $10^{-6}$  (one-in-ten thousand to one-in-million). The national average for cancer risk is presently 0.25 (one-in-four). The acceptable range, therefore, translates to an additional cancer risk of one-in-10,000 to one-in-1,000,000.

Hazard Quotients and Risk for each contaminant and pathway are listed in Tables 20 and 21. Hazard Quotients and Risk were calculated using the current use (worker) and future use (residential) scenarios. The dermal exposure route lacks the toxicity reference values of the other exposure routes. After compensation for absorption factors to develop CDIs, oral RfDs and slope factors were used to assess risks from dermal exposure.

For lead, no reference doses or slope factors are currently approved. Lead contaminant levels are combined in a computer program based on the Uptake/Biokinetic Model to determine a distribution function of blood-lead levels in children. Since the model does not include adults, only the residential scenario is accommodated for lead hazard.

#### Current Use

The site has been used for a cotton gin, then as a battery recycling facility. Light industrial use is considered to be the current-use scenario. Worker exposure frequency used is 240 days per year, with an average 25 year duration working at one location. Workers are assumed to be adults with a 70 year lifetime, a 70 kg body weight, a daily soil ingestion of 50 mg/day, and an exposed body surface area of 5,000 cm<sup>2</sup>.

Using an average concentration derived from all sources and soil within the fenced area, a

non-carcinogenic risk to workers through ingestion of soils is indicated (Table 20) when an average concentration from sources, berm, and soils is considered. Antimony and arsenic are the chemicals of concern which most contribute to this hazard index. The lower hazard indices for individual sources derives from an assumption that the contaminated soil would only contribute 20% of total soil ingestion (from the equation: factor FI = fraction ingested). This factor was included since it is assumed that workers would move around the site, and therefore no single source would be a sole contributor to soil ingestion.

For dermal contact with soils for workers, concentrations from individual sources and from an average concentration level of contamination within the fenced area result in hazard indices greater than one for the lined pond, the berm, and for the average inside the fenced area (Table 21). Antimony and arsenic are the chemicals of concern which most contribute to these hazard indices.

Arsenic is the only inorganic chemical of concern with a verified oral cancer slope factor. Tables 20 and 21 show the chronic daily intake for workers from ingestion and dermal contact with soils. The highest excess cancer risk for workers was through ingestion of soils, calculated from summing the excess risk contributed by each source and the soils. This maximum risk was  $5.1 \times 10^{-7}$ , or 5 excess cancers in 10,000,000 individuals. This is considered acceptable risk, since it is less than EPA's acceptable risk range of 1-in-10,000 to 1-in-1,000,000.

Semi-volatile organic compounds were found in elevated concentrations in the battery waste piles and in dried sludge on the concrete pad. Hazard indices for workers exposed through the routes of ingestion and dermal contact with the waste were significantly less than one (Tables 20 and 21). Maximum cancer risk was  $2.4 \times 10^{-4}$  when risk from all the sources is added. This risk is above the EPA acceptable risk range.

#### Future Use

There are residences within 0.5 miles to the north, east and south of the site. This area currently has no zoning or land-use planning. It is quite possible that the site could be used for residences in the future. A future optimal use scenario would be residential for both adults and children. Exposure frequency for residents is assumed to 350 days per year.

#### Adults

Residential adults are assumed to have a 70 kg body weight, a daily soil ingestion of 100 mg/day, an exposed body surface area of 5,000 cm<sup>2</sup>, a 70 year lifetime, and an average of 30 years at one residence.

For exposure through ingestion of soils, hazard indices greater than one were calculated for soils from the berm, the concrete pad, the lined pond, and for an average concentration from all samples within the fenced area (Table 20). Arsenic and antimony are the chemicals of concern which most contribute to the non-carcinogenic risk.

Both have hazard indices greater than one for the lined pond source and for the average within the fenced area. The hazard index for arsenic is also greater than one for the berm.

For dermal contact with soils for residential adults, hazard indices greater than one were calculated for the berm, for the lined pond, and for an average concentration from all samples within the fenced area (Table 21). Arsenic was the only single chemical for which the hazard index was greater than one, in the berm and the average inside the fenced area, although the hazard index for antimony was close to one for the average inside the fenced area and for the

lined pond source.

Arsenic is the only inorganic chemical of concern with a verified oral cancer slope factor. Tables 20 and 21 show the chronic daily intake for residential adults from ingestion and dermal contact with soils. The highest excess cancer risk for adult residents was calculated from summing the excess risk contributed by each source and the soils for ingestion and dermal contact. This maximum risk is  $2.13 \times 10^{-6}$ , or 2 excess cancers in 1,000,000 individuals. This is within the EPA acceptable risk range of 1-in 10,000 to 1-in 1,000,000.

Semi-volatile organic compounds were found in elevated concentrations in the battery waste piles and in dried sludge on the concrete pad. Hazard quotients for residential adults exposed through the routes of ingestion and dermal contact with the waste was significantly less than one (Tables 20 and 21). Maximum cancer risk was greater than  $10^{-4}$  in both the ingestion and dermal routes of exposure for the battery waste piles. Risk was driven primarily by PAHs in both battery piles. This risk is greater than the EPA acceptable risk range.

#### Children

Hazard indices and risk were calculated for children (up to age 6). Children in a residential scenario are assumed to have a 15 kg body weight, a daily soil ingestion of 200 mg/day, an exposed body surface area of 1800 cm<sup>2</sup> and exposure duration of 6 years at one residence.

For exposure through ingestion of soils, hazard indices greater than one were calculated for soils from each source and for an average concentration from all samples within the fenced area (Table 20). For exposure through dermal contact with soils, hazard indices greater than one were calculated for soils from the berm, concrete pad, lined pond, and for an average concentration from all samples within the fenced area. Arsenic and antimony are the chemicals of concern which most contribute to the non-carcinogenic risk. Within the ingestion route of exposure, the hazard indices for both arsenic and antimony are greater than one for each individual source where measured and for the average of all samples within the fenced area. For the dermal route of exposure, the hazard indices are greater than one for antimony for the lined pond source, for arsenic within the berm, and for both antimony and arsenic for the average within the fenced area.

#### Lead

Neither a reference dose nor a slope factor is available for lead. Risk characterization is developed using the EPA Lead Uptake/Biokinetic (UBK) model. In this model, blood-lead concentration in children age 0-6 is calculated combining exposure along a number of pathways. Exposure pathways included in the model are air, drinking water, indoor dust, paint, and diet. The model includes default values for those exposure pathways for which there are no site-specific data. The output is a probability function of blood lead levels. The target is a probability function showing 95% of the population with a blood-lead level less than 10 micro grams per deciliter (g/dl).

The model used to calculate risk from lead uses concentrations from all media, and therefore the concentrations of lead found in the Remedial Investigation were included in those model runs. For the Cal West site, values for all pathways given in the model except soil were held constant, with soil concentrations varied. Concentrations for those exposure pathways other than soil are as follows:

Air: 0.086 micro grams per cubic meter (g/m<sup>3</sup>), calculated as a geometric mean of concentrations from samples collected during undisturbed site conditions.

Drinking Water: All lead data from the first round of analyses were qualified with "R" and rejected for use. The samples were reanalyzed and produced usable data. Analyses of unfiltered samples from the older monitor wells were not used, since those wells were highly sedimented and development procedures and construction details for these wells are not adequately documented. The highest concentration of lead found in monitor wells constructed during the RI was 15.1 micro grams per liter (g/l) in an unfiltered sample from monitor well MW-9, and this is the value which was used in the lead model. A maximum value for ground water is used because this could be a sole-source well for a residence or worker. The highest concentration of dissolved lead found was 7.7 g/l in a filtered sample from well MW-1.

Indoor dust: Taken at 30% of the value used for soil concentration.

Paint: 0.0; there is no indication of lead-based paint at the site.

Diet and Maternal: Model default values, since there are no site specific data for these categories.

For lead in soils, geometric means are used. The geometric mean is more indicative of the true mean of a set of data which vary widely in value. It is calculated by taking the natural log of each value, finding the arithmetic mean of these, then raising e to the power of this arithmetic mean.

Areas for which geometric means were calculated to be used in the UBK models include soils inside the fenced area, berm samples, waste sources combined, soils inside the fenced area + berm samples, soils inside the fenced area + berm + waste sources, soils outside the fenced area, drainage samples, and soils outside the fenced area + drainage samples. Table 22 shows the geometric means and results from the UBK model for each of these areas.

The results of the UBK model show that, for all areas inside the fence, blood-lead levels would be above the target range (greater than 5% of the population with blood-lead levels above 10 g/dl), even for soils with no waste sources included. Outside the fenced area, blood-lead levels were well below the target for both soils and drainage samples.

Further model runs were made varying the soil concentration input to determine when the target level would be met. An average concentration of lead in soil of 640 mg/kg would result in 95% of the population with blood-lead levels less than 10 g/dl. This is within the EPA recommended cleanup concentration for lead in soil of 500-1,000 mg/kg (OSWER Directive # 9355.4-02).

Additional model runs were made as above, except using a drinking water concentration of 7.7 g/l, which was the highest concentration of dissolved lead detected in ground water samples analyzed during the RI field investigation. For these the result for all areas inside the fence remained greater than the target level.

#### Uncertainty Assessment

Risk assessment involves numerous assumptions and calculations which have inherent uncertainties. A quantitative analysis of uncertainty is not possible because all the associated parameters do not have numerical values. A qualitative uncertainty assessment will provide information regarding the variable factors which affect the overall risk assessment.

Sample collection and analysis methods may be biased, leading to average concentrations for the site which are either too low or too high. For the Cal West site, grid sampling and thorough quality assurance/quality control (QA/QC) procedures were used to reduce sampling uncertainties. A subset of samples were analyzed for a suite of chemicals to ensure no contaminants were

present but not identified. Multiple rounds of sampling were included to confirm previous analyses and resample locations with poor data quality.

Exposure assessments include estimations for most of the parameters used in CDI calculations. Since exposure is a function of the behavior patterns and personal habits of the exposed population, no one value can be assumed representative of all possible exposure conditions. Exposure duration and frequency are generally overestimated (350 days/year for residents), leading to a consequent overestimation of risk. Identification of pathways rely on sampling results, but detailed sampling of all pathways at all locations is not possible. For the Cal West site, air sampling during windy days may result in higher concentrations of contaminants for this pathway. In the ground water pathway, monitor wells and some unfiltered samples were included in the concentration calculations, possibly resulting in a higher estimation of exposure.

Toxicity assessments use published factors and simple addition of risks. Toxicity factors tend to be conservative, resulting in an overestimation of risk. Synergism and antagonism (how different chemicals will act together when in the body) are not well enough understood to allow factorization of the individual risk numbers for each chemical. By adding each chemical risk to develop a total risk for a pathway, then adding pathways to create a single value, total risk may be overestimated or underestimated. It is assumed that risk summations are conservative values.

Risk characterization includes all the above factors in the final analysis. Therefore, it may be either an overestimation or underestimation of risk for the site. Proper QA/QC procedures and use of most recent toxicity data promote the best estimation of risk. It is preferable, and generally assumed, that any variance between calculated and true risk will be an overestimation of risk for a site.

#### Risk Characterization Summary

The Cal West site was most recently used as a battery recycling facility. Contaminants include metals and semi-volatile organic compounds. Hazardous substances, pollutants, or contaminant sources are battery waste piles, lined and unlined evaporative ponds, a berm composed of soil scraped from within the site, and soils within the fenced area. Sampling for the Remedial Investigation included ground water, soils, waste, air, and surface drainage sediments. Risk was evaluated for current use (worker) and future use (residential) scenarios.

Ground water samples contained no chemicals of concern in concentrations greater than EPA Maximum Contaminant Levels. The data do not suggest a release to ground water of hazardous substances, pollutants, or contaminants from the site. Therefore, no risk analysis was completed for the ground water since it is not a complete exposure pathway.

Lead was present in most of the high volume air samples. No other metals or semi-volatile organic compounds were detected in significant concentrations. No pathway-specific risk analysis was completed for the air exposure pathway.

Waste, soils, and drainage sediments were all included in the soil exposure pathway evaluation. Lead was the only hazardous substance of concern found in samples outside the fenced area. Inside the fenced area, hazardous substances of concern used in this risk assessment include antimony, arsenic, cadmium, lead, mercury, nickel, and silver.

For workers, a systemic hazard (non-carcinogenic risk) was calculated for the area as a whole inside the fence. There was a carcinogenic risk calculated from semi-volatile organic compounds in the battery waste piles. For residential adults, a systemic hazard was calculated for the

berm, lined pond, and an average for the area inside the fence as a whole. There was a carcinogenic risk calculated from semi-volatile organic compounds in the battery waste piles. For residential children, a systemic hazard was calculated for every source, the berm, and the area inside the fence as a whole. This assessment does not calculate carcinogenic risks for children.

Risk from lead was determined using the Uptake/Biokinetic model. The model includes lead concentrations in air, water, and soil exposure pathways. A risk is indicated when the model predicts more than 5% of the population would have blood-lead concentrations greater than 10 g/dl. For the Cal West site, risk was indicated for all sources, the berm, and soils inside the fenced area. There was no indication of risk for areas outside the fence. An iterative calculation using lead concentrations from samples at the Cal West site indicates soil lead concentrations less than 640 mg/kg would reduce lead risk below the target level.

Actual or threatened releases of hazardous substances from this site, if not addressed by implementing the response action selected in this ROD, may present an imminent and substantial endangerment to public health, welfare, or the environment.

#### ECOLOGICAL RISK

The ecological risk assessment conducted at the Cal West site consisted of: 1) an ecological site description, 2) identification of the ecological contaminant of concern (hazard identification) and inclusion of a toxicological profile, 3) a description of the objectives, endpoints, and methods used for the ecological field study, 4) characterization of the ecological receptors being assessed, 5) identification of toxicological benchmarks from literature references for each receptor being assessed, 6) an exposure assessment for each of the receptors being assessed, 7) a characterization of risk for each of the receptors being assessed using the hazard quotient method and including a qualitative description of uncertainty, and 8) conclusions, tables, a map, and references.

The ecosystem of concern is a terrestrial desert (Chihuahuan) ecosystem, consisting of grass and shrub habitat. There were no perennial surface water bodies for assessment, just dry arroyos. The terrain has a very slight slope and some rolling topography near the arroyos, but, in general, is fairly flat. The desert plants observed were mainly mesquite, creosote bush, cacti, and grasses. Desert animals observed were lizards, snakes, jack rabbits, kangaroo rats and other rodents, road runners, and other birds. Cattle graze in the study area as well as on Bureau of Land Management (BLM) land to the west of the site. Grasses are more predominant on the south side where fencing prevents access to cattle. No threatened and endangered species were observed or expected to be affected by the site activities.

The ecological hazardous substance of concern attributable to site activities was determined to be lead. The determination of whether there are any other ecological contaminants of concern besides lead was based on full scan chemical analyses conducted on some of the soil and tissue samples. Also, the soil was analyzed for total organic carbon, pH, and grain size to characterize its binding ability and the mobility and bioavailability of contaminants. There were no detections above quantification limits for any site-related chemicals besides lead. There was a BNA (di-n-butylphthalate) detected which was attributed to blank contamination.

The overall objective is to determine ecological risk attributable to Cal West. Other objectives or endpoints evaluated included:

- 1) targeting areas for ecological field sampling (vegetation transects and small mammal trapping) with an X-Ray Fluorescence (XRF) spectrometry field technique which was used to screen soils for lead contamination gradients; 2) determining the biological integrity or viability of

vegetation by surveying vegetative populations on the site as well as in the reference areas to determine ecological differences in structure and function attributable to Cal West; 3) analyzing vegetation and small mammal tissue residues in site and reference samples to determine uptake or bioaccumulation of contaminant(s) attributable to Cal West; 4) estimating bioaccumulation of contaminant(s) attributable to Cal West in other animals higher in the food chain which feed on the vegetation and small mammals directly sampled; 5) measuring indicators of sublethal toxicological effects of lead (such as delta aminolevulinic acid dehydratase which is a blood lead biomarker, and histopathological indicators) in site and reference small mammal samples; 6) identifying toxic benchmarks for lead from literature references for each plant or animal sampled or indirectly assessed; 7) analyzing contaminant(s) attributable to Cal West by atomic absorption spectrometry on random composite site and reference soil samples taken concurrently and collocated with the tissue samples for correlation with tissue residue data; and 8) using the XRF technique to determine whether highway traffic lead emissions are a confounding source of soil lead not attributable to Cal West.

The study was designed to assess ecological risk posed by the site only in areas where soil lead concentrations were below those concentrations (500- 1,000 mg/kg) that would be remediated for the protection of human health. Since earlier studies indicated that the fenced portion (12.5 acres) of the site contained high lead concentration and would be remediated, the ecological sampling was done outside the 12.5 acre fenced area. The study areas sampled were the areas to the north and to the south of the 12.5 acre fenced site area; the reference area sampled was the Bureau of Land Management (BLM) land located west of the site.

In addition to the plant population survey, samples of soils, vegetation (bush muhly grass and mesquite) tissues, and small mammal (kangaroo rat) tissues were taken. Kangaroo rats were selected for assessment because they were the only small mammals trapped in sufficient numbers in both the site and reference areas. The vegetation population survey and tissue residue analyses were to provide information on the availability of habitat and the effects of habitat alteration, the uptake of contaminant(s) in vegetation from soil, and the impacts of contaminant(s) on vegetation and impacts potentially on grazing animals (herbivores). The small mammal samples were to provide information on uptake of contaminant(s) and impact to the small mammals themselves as well as information on site-specific exposure for predators (tissue residue potentially ingested by predators).

The objective in the live-trapping of small mammals was to obtain those species likely to be exposed to contamination and with a home range size limited to the size of the site to facilitate determining ecological risk attributable only to Cal West. In order to indirectly assess ecological risk attributable only to Cal West for other species having a home range size larger than the site and occupying a niche higher up the food chain, an area use factor was calculated. An area use factor is calculated using literature values for home range size, and it is a determination of what proportion the site size is of the home range size. The species selected for indirect assessment of ecological risk were the pronghorn antelope, coyote, and red-tailed hawk. They were selected on the basis of the various ecological niches they occupy and on information from previous local studies estimating their occurrence and available habitat.

In the Receptor Characterization section, life history information from the literature is described for each of the ecological receptors (kangaroo rat, pronghorn antelope, coyote, and red-tailed hawk) being assessed. The life history information described includes body weight, diet (percentage of foods ingested and ingestion rate by weight per day), and home range size.

In the Toxicological-Response Assessment section, toxicity benchmarks from literature references for each of the ecological receptors being assessed are listed. Due to various sampling and analytical difficulties encountered with field toxicity studies, literature toxicity values were

used in the risk characterization. For the animals assessed, the toxicity benchmarks were based on an oral chronic toxic dose. For vegetation, the toxicity benchmark was based on a toxic absorbed tissue value.

There was clear evidence of a soil lead contamination gradient from the site. Soil lead decreased in concentration with distance from the site in both the areas to the north and south of the 12.5 acre fenced site area. There were localized elevations of soil lead in the north and south areas attributable to arroyo drainage and in the north area attributable to a breach which occurred from the site waste pond. Also, soil lead was much greater in the site-related areas compared to the reference area. The reference area lead value measured was representative of background lead measured in other previous local studies unrelated to Cal West. There was no indication of a contaminated soil lead gradient attributable to highway traffic lead emissions that would confound the evaluation of lead impacts from Cal West.

In the Exposure Assessment section, exposure or dose estimates are calculated for each of the ecological receptors. The only exposure pathway evaluated for animals was ingestion of food. The method used has been used in other EPA regional ecological risk assessments. Exposure or dose in food is converted to dose in the receptor (herbivores and carnivores). The formula used multiplies the measured tissue residue value of lead in the food item in wet weight times the percentage that the food item represents in the diet of the ecological receptor times the ingestion rate in weight per day for the ecological receptor times the area use factor discussed above divided by the body weight of the ecological receptor. All terms except the first term in the formula were obtained from literature references. The values for the first term were analyses of the mesquite, bush muhly grass, and kangaroo rat tissue sampled in the field study. Exposure estimates were calculated separately for the site and reference areas.

For vegetation, exposure was evaluated more qualitatively. Since vegetation tissues were not washed, distinction between internal (uptake) and external (aerial deposition) exposure pathways could not be made. Total lead, diethylene triamine pentaacetic acid (DTPA)-extractable lead (an estimate of the availability for plant uptake), and aqueous-extractable lead were measured in collocated soil samples for correlation with plant tissue residues. Vegetation tissue lead values were positively correlated with soil lead values, although there was much less lead in the vegetative tissues compared to that in the soil. Availability of soil lead may be low due to the high soil pH (7.28.1) which was measured. Despite vegetation tissue lead values correlation with soil lead values, there were no apparent vegetation population trends detected in the survey correlated with soil lead that could be attributable to Cal West. Rather, some of the trends in the ecological measures of the vegetation populations could be attributable to differences in habitat, drainage, elevation, moisture, nutrient availability, elevated pH, and cattle grazing.

In the Risk Characterization section, toxicological and exposure information was integrated to estimate ecological risk, and uncertainty was qualitatively described. This was achieved using EPA's hazard quotient method. The hazard quotient is a ratio of the exposure estimate divided by the toxicological benchmark value for each ecological receptor. When the result is less than one, one concludes that there is no indication of significant risk.

For the animals assessed, none of the site-related hazard quotients exceeded one. Therefore, there is no indication of site-related significant risk for the areas evaluated. A probable factor is the small size of the site compared to the larger home range sizes of some of the ecological receptors. The highest hazard quotient was 0.1 found in the kangaroo rat. Proportioning the hazard quotient from 0.1 to one (1) would result in a soil lead concentration higher than the upper end cleanup level of 1,000 ppm used for protection of human health and would be protective of the ecology considering site related risks only. Reference area hazard quotients exceeded one for the coyote and red-tailed hawk which indicates significant reference

area risk (not attributable to Cal West). This was probably attributable to the larger size of the reference area used which encompassed the large home sizes of the ecological receptors and increased the area use factors.

For vegetation, ecological risk was more qualitatively characterized. Although vegetation tissue lead values were significantly different between site and reference study areas, none of the vegetation tissue residue values exceeded the tissue-based toxicity benchmark value used from the literature. Thus, the hazard quotient was inferred to be less than one which does not indicate significant risk to vegetation attributable to Cal West. This was supported by the results of the population survey where no population differences could be attributed to Cal West impacts.

Based on the field investigation conducted at the Cal West site and data from the results of the laboratory analyses, the following conclusions are drawn:

- 1) All site-related hazard quotients were less than one which did not indicate significant ecological risk attributable to Cal West in the areas and at the lead levels evaluated.
- 2) The small size of the site compared to larger home range sizes of ecological receptors higher up in the food chain indicates that it would be an unlikely occurrence for lead (from the areas studied) to bioaccumulate up the food chain.
- 3) There was clear evidence of a soil lead contamination gradient related to Cal West.
- 4) Mean body burden of lead was higher in kangaroo rats collected in the north area, but lead was also present in reference animals.
- 5) Plant species are distributed consistent with regional vegetation patterns. There was no clear indication that exposure of vegetation to site related soil lead resulted in adverse effects as reflected in population measurements.
- 6) Lead availability to plants from the lead contaminated soils is low due to the high pH level in the soil.
- 7) Lead in plants is significantly higher in contaminated areas than in the reference area. However, none of the plant tissue lead values exceeded the tissue-based toxicity benchmark value from the literature.
- 8) Lead in and on plants is available to grazing animals.
- 9) Remediation of soils for the protection of human health within the range of 500-1,000 mg/kg should be adequate regarding ecological risks attributable to Cal West site contaminants.

#### Remediation Goals

The purpose of this remedial action is to control risks posed by ingestion and direct contact with contaminated soils, sediments and the source waste materials. The results of the baseline risk assessment indicate that existing conditions at the site pose an excess lifetime cancer risk of  $2.4 \times 10^{-4}$  through the routes of ingestion and dermal contact for onsite workers. The non-carcinogenic risk to on-site workers through ingestion is as high as 1.8 (Hazard Quotient). For future residential use, total hazard indices greater than one (1) were calculated for children and adults. The maximum calculated excess cancer for residential exposure to the semi-volatile organic compounds was as high as  $10 \times 10^{-4}$ . For lead contamination, the results of the UBK model indicate that for all areas inside the fenced area, calculated theoretical blood

lead levels assuming future residential use were above the target range of greater than 5% of the population with blood lead levels above 10 micrograms per deciliter (ug/dl).

To meet the target range of 95% of the population with blood lead levels less than 10 ug/dl, a residential lead cleanup level of 640 mg/kg was determined for the Cal West Metals site. Cleanup levels to achieve a  $1 \times 10^{-6}$  excess cancer risk or a hazard index value of not greater than one (1) for non-carcinogenic risk for other contaminants under a residential setting at the Cal West site are: antimony-110 ppm; arsenic- .37 ppm ( $10^{-6}$ ) and 270 ppm (HI=1); cadmium- 140 ppm; mercury- 82 ppm; and for PAHs- 3 ppm benzo(a)pyrene equivalents.

## VII. DESCRIPTION OF ALTERNATIVES

### ALTERNATIVE 1: NO ACTION

#### Major Components:

The No Action alternative (Alternative 1) provides a baseline for comparing other remedial alternatives for the Cal West site. Because no remedial activities would be implemented to mitigate contamination present at the site under this alternative, long-term human health and environmental risks for the site are as presented in the baseline risk assessment.

#### Treatment Components:

Alternative 1 provides no treatment, engineering, or institutional measures to control exposure to site contaminated materials. No reduction in risks to human health and the environment would occur.

#### Containment Components:

No controls for exposure, other than the existing fence, and no long-term or short-term site management are included under Alternative 1. This alternative provides no reduction in the toxicity, mobility, or volume of the contaminated soils, evaporation pond sediments, and source waste materials at the site. All existing and potential future health risks associated with the site would remain. Alternative 1 will not provide protection to human health or the environment.

#### General Components:

No direct cost or annual operation and maintenance (O&M) cost are associated with Alternative 1 since no actions would be undertaken to address conditions at the site.

### ALTERNATIVE 2: INSTITUTIONAL CONTROLS

#### Major Components:

Alternative 2 consists of access restrictions, deed notices, zoning restrictions, and consolidating the source waste piles and contaminated soil pile. Access restrictions are aimed at preventing human exposure to contaminated waste materials. This alternative consists of installation of signs warning of the potential hazards associated with the site, together with barriers, such as fences, to restrict site access. Consolidation of the contaminated piles, which include source waste materials and site soils, would be effected by placing these materials in the existing evaporation ponds.

#### Treatment Components:

Alternative 2 provides no treatment to site contaminants and therefore would not comply with ARAR requirements imposed by RCRA Subtitles C and D regarding disposal of hazardous wastes and the State of New Mexico solid waste regulations.

#### Containment Components:

Some reduction in the potential for human exposure to site contaminants would be achieved by consolidating the source waste piles and providing fencing around the contaminated areas. However, no long-term effectiveness would be provided under this alternative due to difficulties in preventing site access. Additionally, this alternative provides no reduction in the toxicity, mobility, or volume of contaminants at the site.

#### General Components:

Capital expenditures under this alternative include costs for warning signs, additional fencing, equipment to consolidate existing piles, and administrative costs for deed notices and zoning restrictions. Additionally, ground water monitoring would be conducted on an annual basis and the site would be evaluated every five years to determine if site conditions are posing additional hazards to human health and the environment. Indirect capital cost items include expenses associated with engineering and design, contingencies, legal and regulatory activities, and mobilization/demobilization.

Annual costs associated with this remedial action are associated with the annual ground water sampling and testing. Indirect annual costs include administration, contingency, and maintenance reserve.

The estimated time to implement this alternative would be approximately six (6) months. The estimated costs for Alternative 2 are: Capital costs: \$45,000; Annual O&M costs: \$5,000; Present worth \$104,000. The present worth cost is based on a life of 30 years and an annual interest rate of 7.5 percent.

### ALTERNATIVE 3: ON-SITE STABILIZATION/SOLIDIFICATION, ON-SITE DISPOSAL AND CAPPING

#### Major Components:

Alternative 3 involves treatment of the contaminated materials at the Cal West site, followed by on-site disposal and capping. Treatment would be accomplished by a fixation process using Portland cement to stabilize and solidify approximately 15,000 cubic yards of contaminated soils, sediments, and source waste materials. Contaminated materials with lead concentrations exceeding the health-based clean up level of 640 mg/kg would be treated to pass the Toxicity Characteristic Leaching Test (TCLP), 40 CFR 261, App. II. After treatment and passing TCLP, the treated material would no longer be considered a characteristic RCRA hazardous waste and can be disposed of without restrictions in an on-site excavation as a RCRA non-hazardous solid waste.

#### Treatment Components:

Although other treatment technologies have been proposed and some are the pilot test stage, fixation is the only proven treatment technology that has been implemented at other lead battery recycling sites contaminated with heavy metals. Based on the treatability studies conducted on site materials, the cement stabilization/solidification process appears to be the most appropriate fixation process for the Cal West Metals site.

Treatability studies (Table 23) conducted on contaminated soil, sediments, and source waste materials indicate that these materials can be treated with cement to pass (values below

regulatory levels) the Toxicity Characteristic Leaching Procedure (TCLP). This test is used in determining if the solid waste is considered hazardous. In the case of lead-contaminated soil and debris, the current TCLP value below which a solid waste is not a RCRA hazardous waste is where it leaches less than 5 parts per million (ppm) lead. Treatability test results further show that by treating the high lead concentrations with cement, metals of concern and the semi-volatiles (source waste) found at the site also pass the TCLP test. Therefore, the stabilization/solidification treatment process would meet the cleanup goal criteria set for the hazardous substances of concern found at the Cal West Metals site.

Implementation of Alternative 3 would consist of leasing a standard portable concrete batch plant and setting it up on site. Portland cement would be purchased in bulk and stored on-site. The contaminated pond sediments, trench areas, and site soils would be excavated and consolidated with existing source waste piles and the soil pile. The site material would then be mixed in the batch plant and Portland cement and water added in quantities based on the treatability studies conducted. Excavated contaminated materials would be replaced with clean soils as required.

#### Containment Components:

Final disposal of the treated materials under Alternative 3 would be in an on-site excavation. The resulting "soil/cement" mixture would then be disposed of in an on-site excavation located in the southwest corner of the fenced area. The treated material will then be capped with a concrete cap to provide added protection and minimize long term O&M costs. Finally, the concrete cap will be covered with 12 inches of clean site soils to blend the excavated area with the natural surroundings. The soil cover will be graded to promote runoff of storm water. Construction details and standards for the on-site excavation would be determined during the remedial design phase prior to implementation of the remedial action. Construction standards would be developed in accordance with Federal and State ARARs. For the Cal West site, an impermeable liner or cap is not required since the treated material would no longer be considered a characteristic RCRA hazardous waste.

Four (4) existing monitoring wells within the disposal area would be sampled annually for the first five (5) years after remedial work completion, followed by ground water sampling once every five (5) for twenty-five (25) years. The site would be evaluated every five (5) years to determine the effectiveness of the site remedy. Site buildings and equipment would be decontaminated.

#### General Components:

Capital expenditures under this alternative include costs for leasing a cement batch plant, purchase of Portland cement, and site remediation work associated with excavation, placement, backfilling, and site grading. Confirmation of achieving the health-based cleanup levels would be conducted by post-remediation sampling and analyses. Indirect capital cost items include costs associated with engineering and design, contingencies, legal and regulatory activities, and mobilization/demobilization.

Operation and Maintenance (O&M) costs associated with this remedial action alternative include ground water sampling and evaluating the site every five (5) years. Indirect annual costs include administration and maintenance reserve and contingency costs.

The estimated time to implement this alternative would be approximately twelve (12) months. The estimated costs for Alternative 3 are: Capital costs: \$1,498,000; Annual O&M costs: \$5,000; Present worth \$1,557,000. The present worth cost is based on a life of 30 years and an annual interest rate of 7.5 percent. Implementation of this alternative would have a short term risk

to site workers during the on-site excavation and stabilization phase. This risk can be minimized by engineering technics and control measures implemented during the remediation phase.

#### ALTERNATIVE 4: STABILIZATION/SOLIDIFICATION AND DISPOSAL AT A MUNICIPAL LANDFILL

##### Major Components:

Alternative 4, Stabilization/Solidification and Disposal at a municipal landfill involves treatment of approximately 15,000 cubic yards of contaminated soils, pond sediments, and source waste materials through cement fixation and followed by transportation to a suitable off-site RCRA non-hazardous landfill for final disposal. Treating contaminated site materials exceeding lead concentrations of 640 mg/kg in Alternative 4 would be the same as in Alternative 3. The difference in the alternatives is that under Alternative 4, the treated materials would be disposed of in an off-site landfill that is acceptable to receive CERCLA wastes pursuant to EPA's Off-Site Policy promulgated pursuant to Section 121(d)(3) of CERCLA, 42 U.S.C. 9621(d)(3).  
Treatment Components:

Treatability studies conducted on contaminated soil, sediments, and source waste materials indicate that these materials can be treated with 20% cement by volume to pass (values below regulatory levels) the Toxicity Characteristic Leaching Procedure (TCLP) test used in determining if the solid waste is considered a RCRA hazardous waste. Treatability test results further show that by treating the high lead concentrations with cement, metals of concern and the semi-volatiles (source waste) found at the site also pass the TCLP test. Therefore, the stabilization/ solidification treatment process would meet the cleanup goal criteria set for the Cal West Metals site.

Implementation of Alternative 4 would consist of leasing a standard portable concrete batch plant and setting it up on site. Portland cement would be purchased in bulk and stored on-site. The contaminated pond sediments, trench areas, and site soils would be excavated and consolidated with existing source waste piles and the soil pile. The site material would then be mixed in the batch plant and Portland cement and water added in quantities based on the treatability studies conducted.

##### Containment Components:

Contaminated site material exceeding lead concentrations above the health-based clean up level of 640 mg/kg would be excavated and treated on-site before being transported off-site to an approved landfill for final disposal. Excavated contaminated materials would be replaced with clean soils as required. Site buildings and equipment would also be decontaminated under this alternative.

##### General Components:

Capital costs for Alternative 4 include excavation of contaminated soils, evaporation pond sediments, and trench areas, site grading, on-site cement stabilization of contaminated materials, and transportation and disposal of the treated materials to an approved RCRA non-hazardous landfill. Confirmation of achieving the health-based cleanup levels would be conducted by post-remediation sampling and analyses. Indirect capital cost items include cost associated with engineering and design, contingencies, legal and regulatory activities, and mobilization/demobilization.

Under Alternative 4, O&M costs would only be warranted for the first year after completion of the remedial work since contaminated materials above health-based levels would be removed from the site and will no longer be a source for potential ground water contamination. Indirect

annual costs include administration, contingency, and maintenance reserve costs.

The estimated time to implement this alternative would be approximately twelve (12) months. The estimated costs for Alternative 4 are: Capital costs: \$2,414,000; O&M costs (one year only) \$5,000; Present worth \$2,419,000. Implementation of this alternative would have a short-term risk to site workers during the onsite excavation and stabilization phase. This risk can be minimized by engineering technics and control measures implemented during the remediation phase.

#### ALTERNATIVE 5: ON-SITE SOIL WASHING AND ON-SITE DISPOSAL OF STABILIZED RESIDUALS

##### Major Components:

In Alternative 5, the volume of contaminated materials would be reduced by washing approximately 15,000 cubic yards of contaminated site soils, sediments, and source waste piles that exceed lead concentrations of 640 mg/kg to remove the hazardous contaminants. Under this alternative, contaminant residuals (sludge) would be stabilized as in Alternative 3 and disposed onsite. However, the volume of contaminated materials to be treated after washing will be much less than in Alternative 3. The aqueous waste stream (acidic solution) from the washing process will require off-site treatment to remove the hazardous substances remaining in solution.

##### Treatment Components:

Treatment involved with Alternative 5 consists of stabilization/solidification of residual materials as in Alternative 3. The soil washing process only removes contaminants from the affected media and is not a treatment process. By removing contaminants through soil washing, the volume of material to be treated would be significantly reduced. The remaining contaminant residual would be treated to pass TCLP and to no longer be considered a hazardous waste prior to on-site disposal. This alternative will meet State and Federal ARARs.

##### Containment Components:

Disposal of the treated residual materials under Alternative 5 would be in an on-site excavation. The resulting "soil/cement" mixture would be disposed of in an on-site excavation located in the southwest corner of the fenced area. The treated residual material will then be capped with a concrete cap to provide added protection and minimize long term O&M costs. Finally, the concrete cap will be covered with 12 inches of clean site soils to blend the excavated area with the natural surroundings. The soil cover will be graded to promote runoff of storm water. Construction details and standards for the on-site excavation would be determined during the remedial design phase prior to implementation of the remedial action. Construction standards would be developed in accordance with Federal and State ARARs. For the Cal West site, an impermeable liner or cap are not required since the treated residual material would no longer be considered a characteristic RCRA hazardous waste.

Four (4) existing monitoring wells within the disposal area would be sampled annually for the first five (5) years after remedial work completion, followed by ground water sampling every five (5) years for twenty-five (25) years. The site would be evaluated every five (5) years to determine the effectiveness of the site remedy. Site buildings and equipment would be decontaminated.

##### General Components:

Capital expenditures under this alternative include costs for the soil washing plant, leasing a cement batch plant, purchase of Portland cement, and site remediation work associated with excavation, placement, backfilling, and site grading. Confirmation of achieving the

health-based cleanup levels would be conducted by post-remediation sampling and analyses. Indirect capital cost items include costs associated with engineering and design, contingencies, legal and regulatory activities, and mobilization/demobilization.

Annual O&M costs associated with this remedial action include ground water sampling and evaluating the protectiveness of the remedy every five (5) years. Indirect annual costs include administration, contingency, and maintenance reserve cost.

The estimated time to implement this alternative would be approximately twelve (12) months. The estimated costs for Alternative 5 are: Capital costs: \$4,715,000; O&M costs \$5,000; Present worth \$4,774,000. The present worth cost is based on a life of thirty (30) years and an annual interest rate of 7.5%. Implementation of this alternative would pose a short-term risk to site workers during excavation and washing of the contaminated materials and during stabilization and disposal of the residual contaminant materials. This risk can be minimized by engineering techniques and control measures implemented during the remediation phase.

#### ALTERNATIVE 6: OFF-SITE DISPOSAL TO A HAZARDOUS WASTE LANDFILL TREATMENT

##### Major Components:

Alternative 6 would consist of excavating all contaminated site soils, sediments, and source waste materials with concentrations exceeding the lead cleanup level of 640 mg/kg. The contaminated materials would then be transported and disposed of in an off-site permitted RCRA Subtitle C hazardous waste landfill. That is acceptable to receive Superfund wastes pursuant to EPA's off-site Policy promulgated pursuant to Section 121(d)(3) of CERCLA, 42 U.S.C. 9621(d)(3).

##### Treatment Components:

Alternative 6 does not include treatment of the contaminated soils, sediments, and source waste materials prior to off-site disposal in an acceptable permitted RCRA hazardous facility.

##### Containment Components:

Contaminated site material above the health-based clean up level of 640 mg/kg would be excavated and transported off-site to an acceptable permitted RCRA hazardous waste landfill for final disposal. Excavated contaminated materials would be replaced with clean soils as required. Site buildings and equipment would also be decontaminated.

##### General Components:

Capital costs for Alternative 6 include excavation of all contaminated materials above health-based levels, associated site backfilling and grading, and transportation of the contaminated materials to a RCRA hazardous waste landfill. Confirmation of achieving the health-based cleanup levels would be conducted by post-remediation sampling and analyses. Indirect capital cost items include costs associated with engineering and design, contingencies, legal and regulatory activities, and mobilization/demobilization.

Under Alternative 6, O&M costs would only be warranted for the first year after completion of the remedial work since contaminated materials above health-based levels would be removed from the site and will no longer be a source for potential ground water contamination. Indirect annual costs include administration, contingency, and maintenance reserve costs.

The estimated time to implement this alternative would be approximately twelve (12) months. The estimated costs for Alternative 6 are: Capital costs: \$7,155,000; O&M costs (one year only)

\$5,000; Present worth \$7,160,000. Implementation of this alternative would have a short-term risk to site workers during the on-site excavation of contaminated materials. This risk can be minimized by engineering techniques and control measures implemented during the remediation phase. Additional risks associated with this alternative would exist with transporting RCRA hazardous wastes to an acceptable permitted RCRA hazardous facility.

#### **VIII. SUMMARY OF THE COMPARATIVE ANALYSIS OF ALTERNATIVES**

The following nine criteria were used to evaluate the remedial action alternatives for the Cal West Metals Superfund site.

##### **1. Overall Protection of Human Health and the Environment**

All of the alternatives, except Alternative 1 (No Action), will provide some degree of overall protection of human health and the environment. The degree to which each alternative provides this protection is discussed below:

Alternative 1 provides no increase in overall protection to human health or the environment. In this alternative, all of the potential risks to human health and the environment associated with the Cal West Metals site would remain.

Alternative 2 will provide minimal protection by consolidating the source waste materials and soil piles in the evaporation pond areas. Direct contact with material on-site will be reduced as long as the fences keep trespassers away from the site. The risk associated with potential air emissions will not be reduced, nor will this alternative address the potential risk to site workers. Alternatives 3 and 5 will eliminate the ingestion and direct contact pathways with the source waste materials and contaminated soils through the stabilization process. Stabilization and solidification of the contaminated materials will minimize the possibility that contaminants can migrate to the ground water under the site. Additional protection will be provided by covering the stabilized material with a concrete cap and soil cover. These alternatives will also eliminate the potential for air emissions from the site. However, Alternative 3 provides protection of public health and the environment while being cost effective. Alternative 5 with its increased cost associated with soil washing provides no greater overall protection than Alternative 3.

Alternatives 4 and 6 provide protection of human health and the environment by the removal of the contaminated material from the site. Because the contaminated materials would be removed down to health-based risks levels, the potential for future contaminant migration to the ground water and for air emissions would be eliminated. Although these alternatives offer protection of human health and the environment to the Cal West site, Alternative 6 will not fully address the treatment of contaminated materials that may pose a health treat at another location. In addition, neither alternative is cost effective due to increased costs associated with off-site transportation and disposal.

##### **2. Compliance with Applicable or Relevant and Appropriate Requirements (ARARs)**

ARARs are federal and state requirements that the selected remedy must meet. For example, material to be excavated and disposed off-site would have to be treated using the best demonstrated available technology (BDAT) to meet the RCRA Land Disposal Restrictions (LDRs) prior to landfill disposal. Contaminated material stabilized on-site will have to be treated to the extent that it is no longer considered a characteristic hazardous waste. Alternatives 3 through 5 will meet RCRA LDRs. Alternative 6 does not meet LDRs for treatment prior to disposal.

### 3. Long-term Effectiveness and Permanence

The Alternatives 1 and 2 would not provide long-term effectiveness or a permanent solution to potential risks associated with the hazardous substances remaining on-site.

Alternatives 3 through 5 involve treatment of the hazardous substances by stabilization. In Alternative 5, the contaminated residuals remaining after undergoing the soil washing process would be stabilized. The effectiveness and the permanence of the stabilization/solidification remedies proposed are very high because the stabilization of lead, and other metals of concern, is essentially irreversible due to the chemical reactions that take place with the stabilizing materials. The addition of a concrete cap to the stabilized materials disposed on-site in Alternatives 3 and 5 will provide additional protection.

### 4. Reduction of Toxicity, Mobility or Volume Through Treatment

Alternatives 1 and 2 do not provide any reduction in the toxicity, mobility, or volume of the contaminated material. Alternatives 3 and 4 use treatment to reduce the mobility of the site contaminants. Alternative 5 meets the same criteria as Alternatives 3 and 4 but also reduces the total volume of contaminated materials to be stabilized and disposed on-site. However, the total volume of contaminants is not reduced. Alternative 6 does not reduce the toxicity, mobility, or volume of the contaminated materials.

### 5. Short-Term Effectiveness

The short-term risk associated with Alternative 1 is the continuation of the risk currently posed by the site. There would be potential short term risks to site workers during implementation of all the other alternatives since they all will require some excavation and transportation on- or off-site of the contaminated material. Some increase in air emissions may occur during excavation activities and during the stabilization process on-site. However, engineering controls and monitoring will reduce the potential for any adverse impacts during implementation of the treatment remedies. A contingency plan would be developed to address any potential air emissions during remedial activities.

There is also a potential risk for accidental release of contaminants during the off-site transportation of excavated material to an RCRA hazardous or non-hazardous off-site landfill facility.

### 6. Implementability

Treatability studies conducted on materials from the Cal West Metals site indicate that stabilization would effectively immobilize and eliminate the hazardous characteristics of the contaminants of concern found at the Cal West site. On-site stabilization of contaminated materials can be easily implemented using readily available equipment for excavating, mixing, and placement. The construction of a concrete cap and soil cover over the treated material would be easily implemented, as would the excavation and off-site landfill disposal alternatives. Construction of an excavation on-site can be easily implemented using earthwork excavation equipment. The soil washing alternative will be harder to implement because of the specialized equipment that would be mobilized onsite.

### 7. Cost

The present worth cost of the selected alternative, Alternative 3, is \$1,557,000. Alternatives 1 and 2 have lower cost than the selected alternative but are considered unacceptable for the reasons previously discussed in this document. The other alternatives have higher costs ranging

from \$2,419,000 to \$7,160,000. The off-site disposal to a hazardous waste landfill facility without treatment has the highest cost of \$7,160,000.

#### 8. State Acceptance

The State of New Mexico through the New Mexico Environment Department concurs with EPA's preferred alternative (Alternative 3) of on-site stabilization, on-site disposal and capping.

#### 9. Community Acceptance

The citizens from the community of Lemitar and the majority of the citizens from the surrounding community of Socorro recommended that the contaminated site materials be treated at the lowest cost that provides protection to human health and the environment. The citizens agreed that Alternative 3 presented in the Proposed Plan meets these requirements. Alternative 3 is EPA's selected alternative to remediate contaminants at the Cal West Metals site.

### **IX. SELECTED REMEDY**

Based upon consideration of the requirements of CERCLA, the detailed analysis of the alternatives using the nine criteria, and public comments from the local community, both EPA and the State of New Mexico (NMED) have determined that Alternative 3, On-site stabilization, On site Disposal and Capping, is the most appropriate and protective remedy for the Cal West Site in Lemitar, New Mexico.

Approximately 15,000 cubic yards of contaminated soils, sediments, and source waste materials with lead concentrations exceeding the health-based cleanup level of 640 mg/kg will be treated by stabilization/solidification with cement and disposed in an on-site excavation. The disposal area will be capped with concrete and covered with twelve (12) inches of clean site soils. The estimated costs for the selected remedy are: Capital costs: \$1,498,000; Annual O&M costs: \$5,000; Present worth \$1,557,000.

#### Cleanup Levels

To meet the target range of 95% of the population with blood lead levels less than 10 ug/dl, a residential lead cleanup level of 640 mg/kg was determined for the Cal West Metals site. Cleanup levels to achieve a  $1 \times 10^{-6}$  excess cancer risk or a hazard index value of not greater than one (1) for non-carcinogenic risk for other contaminants under a residential setting at the Cal West site are: antimony-110 ppm; arsenic- .37 ppm ( $10^{-6}$ ) and 270 ppm (HI=1); cadmium- 140 ppm; mercury- 82 ppm; and for PAHs- 3 ppm benzo(a)pyrene equivalents.

### **X. STATUTORY DETERMINATIONS**

Under CERCLA section 121 42 U.S.C. 9621, EPA must select remedies that are protective of human health and the environment, comply with applicable or relevant and appropriate requirements, are cost-effective, and utilize permanent solutions and alternative treatment technologies or resource recovery technologies to the maximum extent practicable. In addition, CERCLA includes a preference for remedies that employ treatment that permanently and significantly reduce the volume, toxicity, or mobility of hazardous wastes as their principal element. The following sections discuss how the selected remedy meets these statutory requirements.

#### Protection of Human Health and the Environment

The selected remedy protects human health and the environment through stabilization and solidification of contaminated soils, sediments, and source waste materials and on-site disposal

of the treated materials. The disposal area will be capped with concrete and covered with clean soil.

Stabilization and solidification of the contaminated soils, sediments, and source waste materials will eliminate the threat of exposure to the contaminant of concern through direct contact with or ingestion of contaminated site materials. The current excess cancer risks associated with these exposure pathways is  $2.4 \times 10^{-4}$ . By excavating the contaminated soils, sediments, and source waste materials and treating them through stabilization and solidification, the cancer risks will be reduced to less than  $1 \times 10^{-6}$ . This level is within EPA's acceptable risk range of  $1 \times 10^{-4}$  to  $1 \times 10^{-6}$ . The minimal short-term threats (contaminated dust) to site workers during implementation of this remedy can be readily controlled through construction and engineering methods.

#### Compliance with Applicable or Relevant and Appropriate Requirements

The selected remedy of on-site stabilization/solidification and onsite disposal and capping of source waste material, soils, and sediments will comply with all applicable or relevant and appropriate requirements (ARARs).

The ARARs are presented below:

#### Chemical-Specific ARARs:

Identification and Listing of Hazardous Waste (40 CFR Part 261), Subpart C - Which identifies those solid wastes which are subject to regulation as hazardous wastes.

National Emission Standards for Hazardous Air Pollutants (40 CFR Part 61)

National Ambient Air Quality Standard (40 CFR Part 50)

#### Location-Specific ARARs:

No location-specific ARARs have been identified for the Cal West Metals site.

#### Action-Specific ARARs:

- Land Disposal Restriction (LDR) (40 CFR Part 268)

#### Cost-Effectiveness

EPA believes that the selected remedy is cost effective in remediating the contaminated soils, sediments, and source waste materials at the Cal West site. The selected remedy meets the criteria set forth in the NCP for determining cost-effectiveness. The estimated present worth cost of the selected remedy is \$1,557,000 and provides an overall effectiveness proportional to its cost.

#### Utilization of Permanent Solutions and Alternative Treatment Technologies to the Maximum Extent Practicable

EPA and the State of New Mexico have determined that the selected remedy represents the maximum extent to which permanent solutions and treatment technologies can be utilized in a cost-effective manner to address site contaminants. Of those alternatives that are protective of human health and the environment and comply with ARARs, EPA and the State have determined that this selected remedy provides the best balance of trade-offs in terms of long-term

effectiveness and permanence, reduction in mobility, or volume achieved through treatment, short-term effectiveness, implementability, cost, while also considering the statutory preference for treatment as a principal element and considering state and community acceptance.

The selected remedy treats the principal threats posed by the contaminated soils, sediments, and source waste materials by achieving significant reductions in the leaching of contaminant constituents from the contaminated materials. The selected remedy provides the most effective treatment of any of the alternatives considered and will cost less than off-site disposal of treated or untreated hazardous substances. The selection of treatment of the contaminated materials and source waste is consistent with program expectations that highly toxic and mobile wastes are a priority for treatment and often necessary to ensure the long-term effectiveness of a remedy.

#### Preference for Treatment as a Principal Element

By stabilizing and solidifying the contaminated soils, sediments, and source waste materials, the selected remedy addresses the principal threats posed by the hazardous substances found at the site through the use of treatment technologies. By utilizing treatment as a significant portion of the remedy, the statutory preference for remedies that employ treatment as a principal element is satisfied.

#### **XI. DOCUMENTATION OF SIGNIFICANT CHANGES**

The Proposed Plan for the Cal West Metals site was released for public comment on July 20, 1992. The Proposed Plan identified Alternative 3, Onsite Stabilization/Solidification, On-site Disposal and Capping, as the preferred alternative to remediate contaminated soils, sediments, and source waste materials. EPA reviewed all written and verbal comments submitted during the public comment period. Upon review of these comments, it was determined that no significant changes to the remedy, as originally identified in the Proposed Plan, were necessary.